THE MONTHLY REVIEW

American Electroplaters' Society

Society for the Advancement of the Science of Electroplating

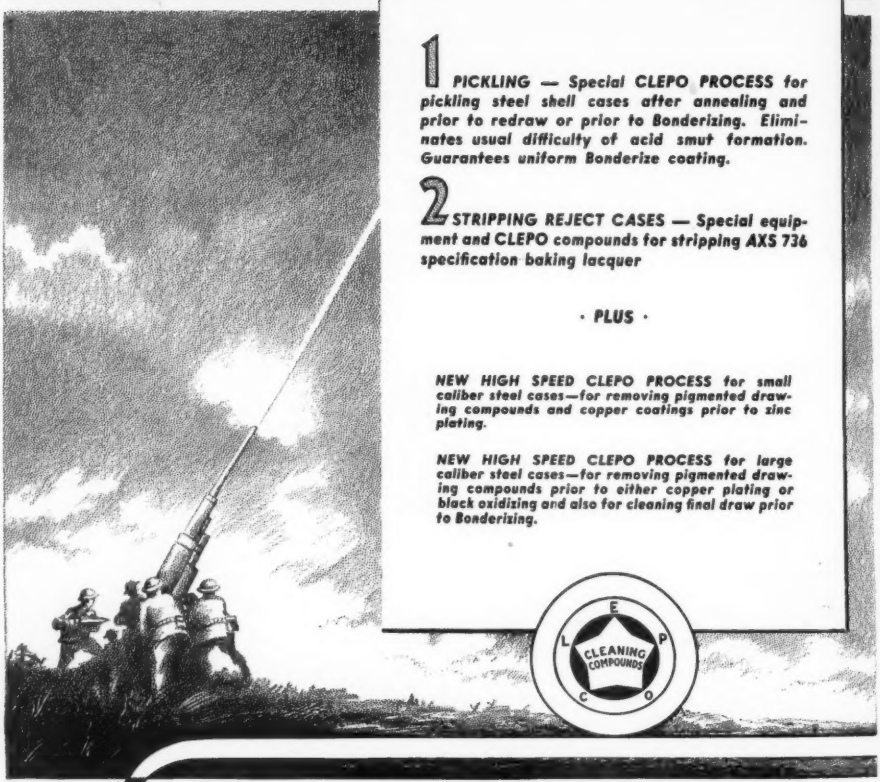
JANUARY 1943

★

War Finishes Issue

Check these 2 NEW DEVELOPMENTS

FOR STEEL SHELL CASE MANUFACTURE···



1 ***PICKLING — Special CLEPO PROCESS for pickling steel shell cases after annealing and prior to redraw or prior to Bonderizing. Eliminates usual difficulty of acid smut formation. Guarantees uniform Bonderize coating.***

2 ***STRIPPING REJECT CASES — Special equipment and CLEPO compounds for stripping AXS 736 specification baking lacquer***

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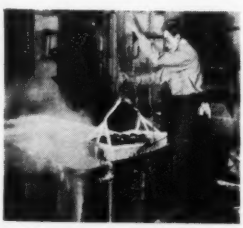

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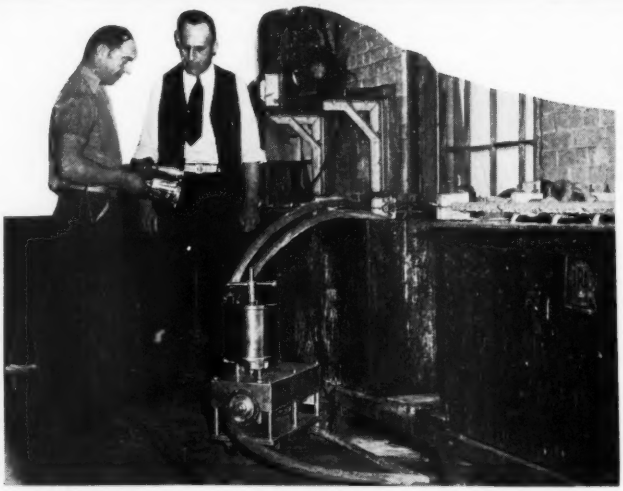

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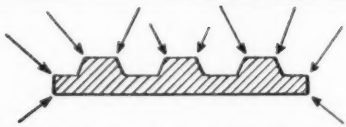

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THE MONTHLY REVIEW

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★

E. T. CANDEE, *Acting Editor*

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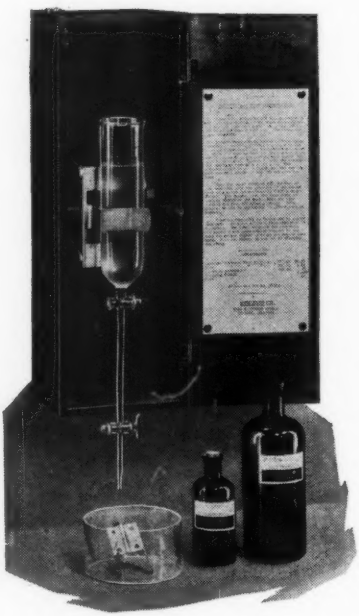
ZINC

SOLUTIONS AND DEPOSITS



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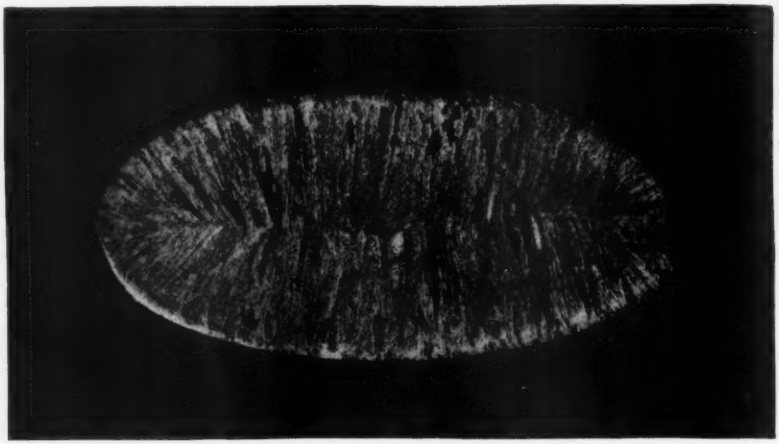

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LOOSE nickel in high acid or low pH baths is due to the attack of the acid on the bonding material, which isolates the nickel grains before they can dissolve. This is reduced to a minimum by the "anchored" spokelike grain structure of our "Seycast" 99%+ Pure Cast Nickel Anodes. The grains (see above) are long and narrow, extending to a common center. As the acid can penetrate only a slight distance between boundaries, the grains tend to remain solidly in place during the entire process of corrosion.

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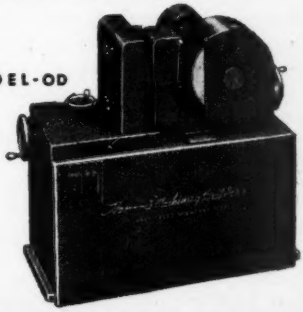
MODEL-OD



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It is not possible to specify the size of Alundum grain for the first operation without knowing the condition of the surface of the metal. The surface may be covered with scale or the scale may have been pickled or tumbled off. In the case of stainless sheet the surface may or may not contain a large number of pits which, if present, would necessitate "spot polishing" and greater stock removal. Norton engineers are available to assist you in studying the job in your own plant.

3. The Operating Speed of the Polishing Wheel

It is necessary to study this factor in order to determine how to set up the most economical polishing wheel. The average speed of polishing wheels is approximately 7500 surface feet per minute. If the speed of the wheel is much higher, say 9000 surface feet per minute, it is necessary to set up a denser wheel head by increasing the strength of the bond mix by approximately 5% (lower speed/vice versa).

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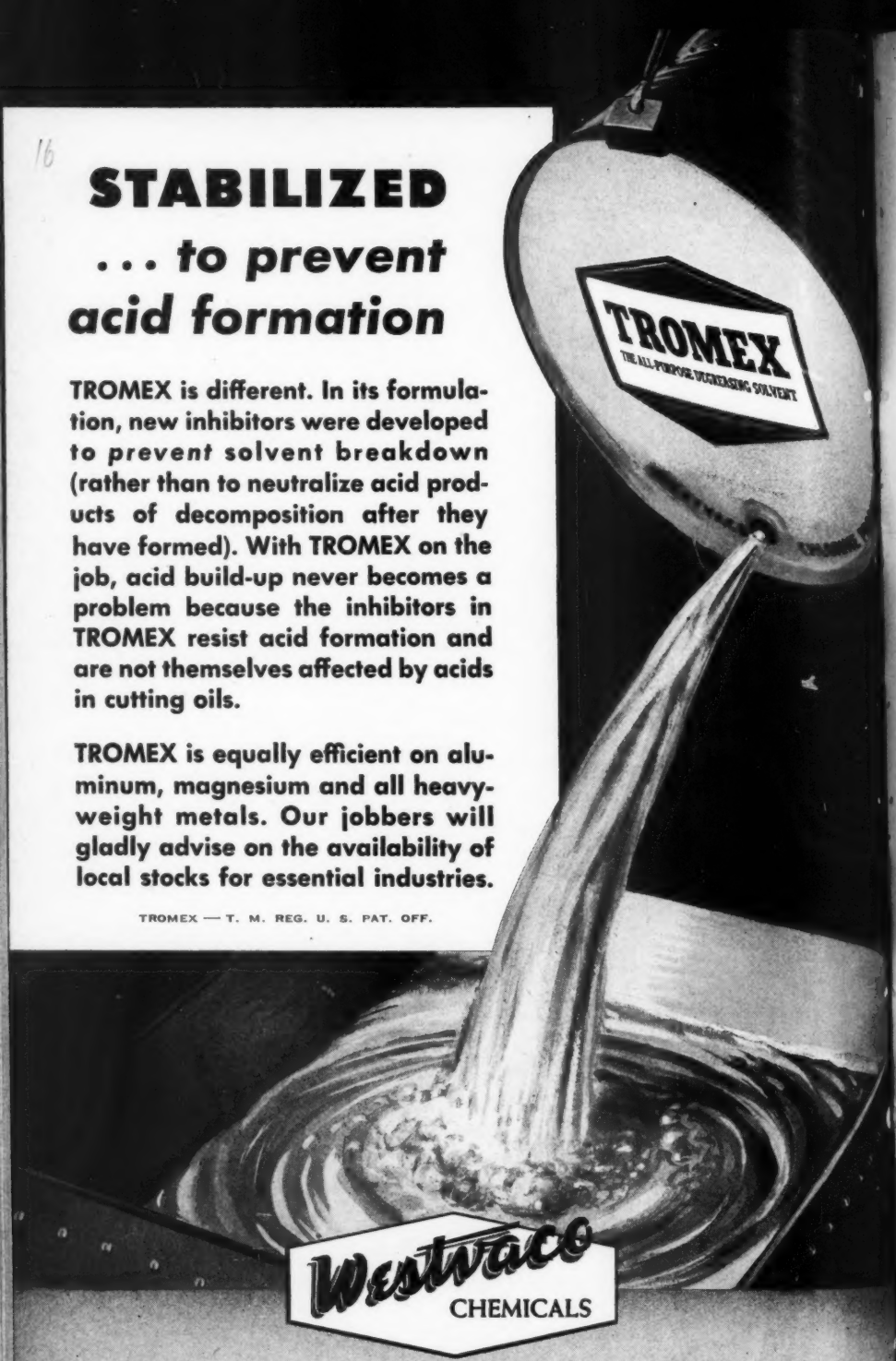

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Progress to Fit the Times

WITH this issue of the Monthly Review, we herald the dawn of a new day in the official publication of this society.

Slowly, but surely, the A.E.S. has forged ahead in the education of its members. Today, it stands supreme as the greatest medium for the dissemination of the knowledge of electrodeposition. Your executive board believes that all phases of this society should be constantly developed and improved.

Membership rolls are apt to suffer before our difficulties are removed. Attendance at regular meetings is already becoming a problem in some branches. Speakers are becoming more difficult to secure. These things are to be expected, but they need not deter us from the prosecution of our appointed task.

The A.E.S. is not an infant. It has long since become of age. Because it has a purpose and ideal, it will always function; because its members believe in that purpose, it will continue to serve through this time of stress. Through the pages of the Review, we hope that many messages which in brighter times might have been brought direct, may still come to you. That is why we have chosen to concentrate on that which should be of greatest value to you as a member of the A.E.S.

Read your Review! Patronize its advertisers and make suggestions for its further improvement. In so doing, you will accomplish the double purpose of helping yourself and helping the A.E.S. to maintain the high standard it merits.

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Electroplating and the War

By WILLIAM BLUM

Chemist, National Bureau of Standards

ONE way to evaluate the present importance of electroplating in the war effort is to compare conditions now and in the last war. Under the title "Military Applications of Electroplating," I summarized this situation in 1918[1] and again in 1942.[2] Comparison of these reports shows that electroplating plays a different and more important role now than in 1918, largely for the following reasons:

1. *Materials* — In 1918 there was no serious shortage of the metals used in plating, either for civilian or military use. The present scarcity, especially of nonferrous metals, has almost eliminated civilian production of articles normally plated. However, the substitution of steel for other metals has involved many new extensive applications of plated coatings on military equipment.

2. *Methods of plating* — In 1918 the largest military applications were of zinc, lead and black-nickel plating. Since then, cadmium and chromium plating have become commercially practicable and are now extensively applied on military supplies. The industrial and military uses of silver and nickel plating have increased. Plating with metals of the platinum group, especially rhodium, has found important military applications.

3. *Specification and testing* — As a result of (a) the rapid development of the automobile industry, (b) the researches conducted at the National Bureau of Standards by the American Electroplaters' Society, and (c) the joint specifications of the A.E.S. and A.S.T.M., many of the military types of plating can be specified and produced with little delay. Even in the more highly specialized uses of plating, the above activities expedite the selection and procurement of satisfactory products.

The methods of testing plated coatings have been greatly improved and standardized since 1918. Non-destructive magnetic methods of measuring the thickness of coatings have facilitated plant inspection of plated products.

4. *Recognition of the importance of plating* – In 1918 it was difficult to convince military authorities that there were many important applications or problems of plating. The present employment by the War Production Board of W. W. McCord on plating equipment, and of A. K. Graham and G. B. Hogaboom in the Conservation Division is evidence that plating plays an important part in the war effort. From the W.P.B., War and Navy Departments, Maritime Commission, Economic Defense Board, National Defense Research Committee, and other governmental agencies, numerous plating problems are referred to the National Bureau of Standards and other research laboratories. Many of these subjects were mentioned in my report to the A.E.S. in 1942, and will be referred to in the papers that follow this introduction.

As explained to the A.E.S. in June 1942 by W. W. McCord, large total amounts of base metal and coating metals are now consumed in plating for military and other essential purposes. Because, however, an increasing use is being made of preplated sheets, especially with tin and zinc on steel, a smaller number of platers may be employed. The increased use of paint and lacquer coatings may absorb the services of some platers.

In order that electroplating may do its full share in the war effort, it is necessary for everyone connected with this industry to apply not only his energy but his ingenuity, and thus to meet the urgent requirements in spite of shortages of materials and changing processes. Just as in 1918, the experiences of this war will force manufacturers, chemists, and platers to evaluate critically the processes they have used normally and taken for granted. As a result, this industry will not only contribute directly to the war effort, but will also build a foundation upon which a stronger and larger industry will later be established.

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[1]Trans. Am. Electrochem. Soc. *34*, p. 169 (1918).

[2]A.E.S. Convention Proceedings, p. 5 (1942).

Think

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☆ No Prime Coat Necessary

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An Appreciation of Charles H. Proctor

By E. T. CANDEE

THE death of Charles H. Proctor which was announced in the December Monthly Review, came as a distinct shock to all his friends and associates even though his health had not been of the best for some time. Several Branches have passed resolutions on his death and sent copies of the resolutions to his family and many other Branches have asked the Acting Secretary to convey their feeings to the family. The appreciation of the Society cannot be better stated than it has been in the appreciation written by one of his oldest friends, George B. Hogaboom. Mr. Hogaboom was associated with Mr. Proctor in advancing the Society and their many associations on all sides of all questions is a tribute to both men. The following tribute is as it was written by Mr. Hogaboom.

> Mr. Charles H. Proctor has passed away, but the monument for which he laid the foundations will live forever. When he laid the corner stone of this monument he had no conception of the structure that would be built around it.
>
> Mr. Proctor was a rule-of-thumb plater, as were nearly all electroplaters at that time, yet through his bringing into existence the National ElectroPlaters' Association which later became the American Electroplaters' Society, the rule-of-thumb control of electroplating solutions has been definitely replaced by the scientific control of not only the plating solutions, but all the varied operations of cleaning, pickling, and final finishing of metals.
>
> He and he alone conceived the plan of bringing electroplaters together to discuss their problems, to exchange ideas, and to bring about a greater respect for the electroplater and his work. His foresight in establishing an "Educational Society" was, and still is, unique in the organization of men who follow a certain vocation.

One has to but contrast the papers that were presented at the early meetings, papers that were difficult to obtain because each plater religiously guarded his secret formula, with the scientific and educational papers presented at the conventions of today. Discussions were rare, many times with the request that what was said be considered confidential as the manufacturer as well as the plater considered methods used were their private property and in no case were they to be disclosed to a competitor. Today the length of discussions at conventions often have to be limited and those presented are reported and published in the "Transactions". Every member whether he attends the convention or not receives a copy.

The electroplaters owe a debt of deep gratitude to Mr. Proctor for this epical progress, for had the society been formed to discuss working conditions and remuneration, the real value of its organization would have been lost.

No one was more generous than Mr. Proctor in not only giving information, but also in personal assistance to the plater in overcoming any difficulty. He pioneered in conducting a shop problem section in a trade journal devoted to electroplating.

His continued interest in the advancement of electroplating in his declining years was proved by the establishment of the Proctor Award for the best paper read at each convention of the society of which he was the founder. This was in memory of his wife whose home was always open to those who wished to talk plating with her husband.

The debt of gratitude owed Mr. Proctor by both the electroplating industry and the plater himself is far greater than can be comprehended or put into words.

The monument—"The American Electroplaters' Society"—shall always be a memorial to Charles H. Proctor.

G. B. HOGABOOM

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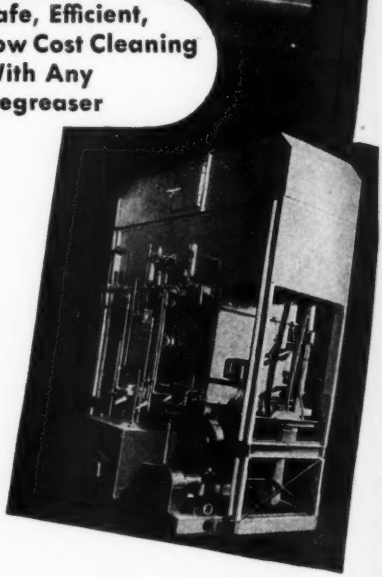

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Copper Plating for Engineering Purposes on War Equipment

By J. E. STARECK
United Chromium

DUE to the general shortage of copper metal as a result of the war production program, many limitations and restrictions on uses earlier contemplated for electrodeposited copper have necessarily been imposed, but nevertheless a limited number of uses, some old and some new, still are used and will no doubt continue to be used for the simple reason that they have been found to be most desirable, if not absolutely essential, for the proper functioning of certain phases of the war program.

It is inadvisable in times like these to describe in full detail the various applications of copper plating on war equipment and, therefore, only a general review of the field will be attempted at this time.

One of the more common uses for copper plating at present is in the field of selective hardening by carburizing or case hardening. Here copper is either deposited only on the areas which are not to be hardened, by properly stopping-off the active areas with a stop-off resist during the copper plating, or, it is deposited on the entire surface of the article and then machined off of the areas to be hardened. In the former case, the resist is removed after copper plating, and the article is then ready for hardening. Several well-known methods of hardening are used, the most common being pack or box carburizing, gas carburizing, salt bath carburizing and cyanide hardening.

A typical use of copper plating in selective hardening is in the production of gears. The gear blank is given a copper deposit, the gear teeth are cut, exposing the wearing surfaces which are then carburized and hardened. In using copper plating for this purpose, it is essential that deposits be dense and impervious so that there is no carbon penetration.

The finish of the base metal, that is, whether it is plain, pickled, sand-blasted, lathe-turned, polished, etc., is important in determining the proper thickness of copper to apply for satisfactory protection against

penetration of carbon. Other factors are the method of manufacture, i.e., whether it is forged or cast, and the degree of alloying of the steel with other metals. In general, the poorer the finish or the higher the alloy content of the steel, the thicker the copper plate must be for effective resistance to penetration. In mild cases only 0.0002″ of copper is required for satisfactory results, while in more difficult ones as much as 0.002″ or even 0.003″ is required. In this connection, it is interesting to note that electrolytically deposited cuprous oxide has recently been shown to be effective for certain purposes in thicknesses far less than those required for metallic copper.

Another common type of hardening is called "Nitriding". Formerly this type of hardening was stopped-off only by means of tin. More recently, however, copper has been tested and found to be entirely effective, at least for certain applications, and as a result of the increasing scarcity of tin, copper is being used in place of tin for this purpose.

Perhaps the two outstanding physical properties of copper are its toughness and its ductility. These properties are made use of in many ways, but one place where they are used very effectively in the war program is in the use of electrodeposited copper on steel parts to act as a lubricant, prior to deep drawing operations. Here no other metal has proved to be as effective as copper in minimizing wear in dies, and as a result, copper is used in this field for a number of different types of drawing operations.

A further refinement in the application of this same principle is in the use of electrodeposited copper on steel strip which can be subsequently blanked and formed into various finished copper-clad articles for military purposes. In this case the copper serves the double purpose of coating the steel and at the same time serving as a lubricant during the drawing operations. The steel strip is plated in continuous operation using full-automatic equipment. After plating it is collected in rolls which are conveniently handled and shipped in this form.

Another related application for electrodeposited copper is not as a lubricant for drawing dies but as a lubricant against steel for certain types of bearing surfaces as, for example, on the external faces of racer rings. Here again, the two dissimilar metals, one hard and rigid and the other soft and ductile, give a combination which minimizes vibration, chattering, and seizing, so common where both bearing surfaces are of the same metal.

A limited amount of copper plating is still carried out in bulk by barrel plating certain parts which are too small to handle economically on plating racks. A number of small parts for use as contacts and for electrical conductivity are now being heavily copper plated on steel and then silver plated as a substitute for the solid copper formerly used. Here the rigidity of the steel base in some cases makes the final article more rugged and durable than before. In this connection, use is being made of the latest developments in barrel plating copper so that more rapid rates of deposition can be obtained, and at the same time fewer operating difficulties are encountered.

Another important application of copper plating is in the field of electroforming and printing. Here many types of instrument dials, scales, etc. are made of electroformed copper. A heavy copper plate is applied over a matrix which has been previously treated so that the copper deposit can readily be separated from it, after the desired thickness has been electrodeposited. The use of electroforming in the printing industry need hardly be mentioned, as its use is well known. The only change in this field at present is in the direction of producing the electroformed article in increasingly shorter operating time intervals. The other big use for copper plating in the printing industry is on steel rolls which are built up with electrodeposited copper either to be used alone for printing or as a base for a subsequent Ballard shell. The face of the roll or the shell is etched with the desired imprint and then inked, and transferred by means of a printing press to the final material which may be paper, cloth, metal, or other desired flat surface.

Many developments and improvements in the field of copper plating have been made, but the full extent to which these modern methods and developments have improved the art will be fully appreciated only when the unlimited use of this metal in the electroplating industry is once more made possible.

EDITORS NOTE:

Front cover illustration was furnished through the courtesy of E. I. Du Pont de Nemours & Co.

Burring and Its Application to the War Program

By R. P. CRANE
Vice President, Lea Manufacturing Co.

A TYPICAL example of the extreme changes which industry undergoes during times of National emergencies is Burring. Even the term itself was little known or used prior to the development of the Armament Educational Program by the United States Government. However it soon became an extremely annoying means of expressing an untold series of time-consuming hand operations which heretofore had never been considered by industry as essential. Strict Government specifications however demanding the absolute minimum in friction soon made it necessary for Production and Process engineers to spend many sleepless hours trying to figure out burring methods whereby both production and precision would be taken care of. Hand operations were commonly resorted to and filing became a great national indoor pastime. As a result of this tremendous rush to what appeared to be the only expedient available to satisfy rigid government inspection, production bottlenecks were created which by their very nature cried aloud for improvement.

This condition naturally, came to the attention of the Metal Finishing Industry whose experience and ability on numerous occasions where mechanization was requested in place of crude hand abrading operations, made them the logical source for relief from these high cost conditions. Out of this work by the Metal Finishing Industry came a multitude of mechanical operations all of them suited for the particular job involved, and all of them likewise a big improvement over hand filing, scraping, steel wool, emery cloth, etc.

These mechanical methods were complete in that they covered the entire metal abrading field and all having as their major premise a mov-

ing vehicle. This condition consequently promoted the use of abrasives, both natural and artificial, and further emphasized industry's dependency generally upon the abrasive industry and its accessories.

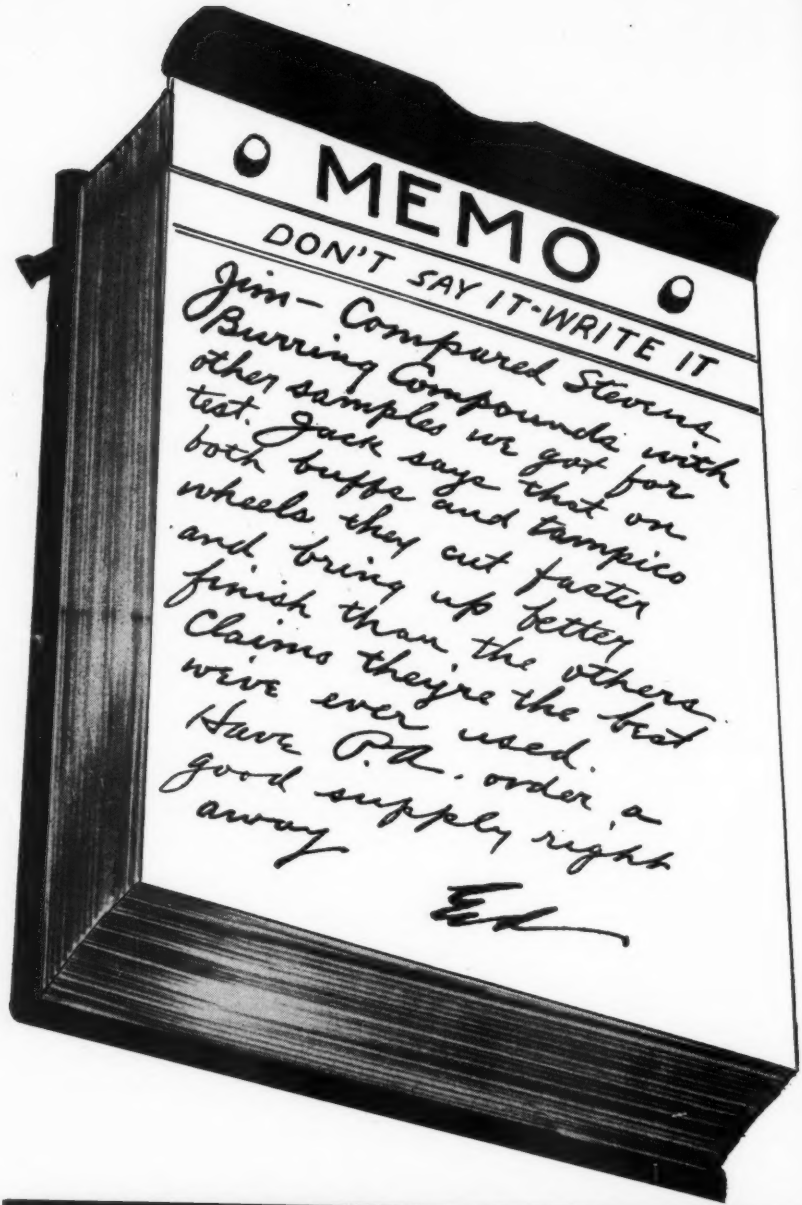
A listing of the mechanical methods found suitable would include rolling or tumbling, polishing wheels and their accessories, rotary files, abrasive belts and discs, sand blasting, wire wheels, Tampico brushes, abrasive points including abrasive impregnated rubber mounted on flexible power tools, and the use of patented greaseless compounds for flexible polishing which includes the use of buffing wheels and string brushes, varied shaped soft density felt bobs, cones, pencil points, etc.

Anything and everything in fact which could abrade and could also be conveniently suited to mechanical processing was tried and found to have some particular place in the picture. A detailed explanation of the various uses and ramifications of each individual method is not permitted in the space available here. However the enormous volume of metal parts essential to the War industries now being burr processed mechanically as opposed to the former hand methods is indeed a tribute to typical American ingenuity.

The utilization of a great mass of present equipment, formerly used in peacetime, in these burring operations, has taken the pressure off many already hard pressed manufacturing plants whose first reaction to these rigid Government orders calling for extreme precision was one of desperation inasmuch as it appeared new equipment would have to be obtained and a consequent loss of time and invested capital in static equipment involved.

The Metal Finishing Industry has undoubtedly found a place in the burring field where they could perform a useful function in the War Effort, and have promoted this field not only for their own benefit but also in such a way that production has been materially increased and cost decreased.

Due to the confidential nature of a great many burring operations details are necessarily lacking in discussing specific applications, but the foregoing is merely by way of stating that the burring bull has been taken by the horns and is being thrown for a good old-fashioned loss. This is the American way.


MEMO
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Jim- Compared Stevens Burring Compounds with other samples we got for test. Jack says that on both buffs and tampico wheels they cut faster and bring up better finish than the others. Claims they're the best we've ever used. Have P.D. order a good supply right away
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"EVERYTHING FOR THE POLISHING AND PLATING PLANT"

Supplies and War Production

By W. D. STARR

The Lea Mfg. Company, Waterbury, Connecticut

ONE year ago, in the January, 1942 issue of *The Monthly Review*, we reported the critical situation in connection with tin and rubber. At that time we had been at war in the Pacific for one month and it was plain to be seen that imports of these items from the Far East would be stopped almost entirely for the duration. In the plating industry, tin had replaced nickel in a great deal of civilian manufacture, so this was mighty bad news for the platers.

This was only one year ago but it is remarkable how completely we are adjusted to the situation. It is even hard to remember that we were so excited about it at the time. It seems incredible that so much civilian production was going on a comparatively few months ago. Passenger car production was not stopped until February 1, and during the Spring 1942, zinc could be used without restriction for plating any items, civilian or otherwise.

Summer and Fall brought rapid conversion of the industry to wartime production. Perhaps the most important contribution was the restriction placed on steel which eliminated the manufacture of many items which formerly passed through the plating room. Practically every plating metal which had not previously been restricted was brought under close control, reserving the supply for war needs. Copper, Nickel, and Cadmium were most strictly allocated and zinc went under careful control as well.

At present, lead is being viewed with interest because of its availability and in some cases its properties are found to be adequate. A unique situation exists, even after a year at war, in connection with chromium plating. Chromic Acid, Sulphuric Acid, and Lead for anodes are comparatively easy to obtain. This avoids interruptions and delays in connection with war work, but due to the steel shortage, it doesn't offer a solution to the production of civilian metal goods. Such merchandise is definitely out for the duration.

A long series of control measures have been applied to the industry at large all pointing toward conservation of metals for implements of war. A lot of progress has been made and it is satisfying to know that our efficient conversion of plating facilities is having a telling effect. It is still incredible that so many changes have taken place in one year. It shows that our industry is alert and is making a valuable contribution to the Victory Program.

Nickel Plating

By GEORGE F. GEIGER
International Nickel Co., Inc.

NICKEL plating for civilian use, which was chiefly decorative, has been stopped completely. At the present time, a considerable tonnage of nickel for plating is being released only for the War Effort and Operational Purposes. These uses are:—(1) protection against corrosion, (2) protection against oxidation at moderately high temperatures, (3) salvaging worn parts, (4) salvaging mismachined parts, (5) wear resistance, and (6) electroforming. Because of their relation to the War Effort, it is impossible to give the applications in detail.

Hard Chromium

By ARTHUR W. LOGOZZO
Hartford Chrome Corporation, Hartford, Conn.

THE value of hard chromium plating has been recognized in some quarters since its inception some fifteen years ago. The outbreak of war pushed its full value before the industrial world and is now looked upon as one of the greatest single salvage mediums as well as the greatest life prolonger of new equipment.

All types of wear surfaces on machines, tools, jigs, fixtures and gages of all descriptions are hard chrome plated before being put into service. (Fig. I.) When these plated surfaces are worn, the life of which is considerably longer than the original they can be replated and ground and a new piece is obtained only for the additional expense of resurfacing.

A lack of concentrated effort on the part of the plater who has been forced into hard chromium plating by the war has resulted in unsatisfactory work and a loss of confidence in hard chromium plating. In most cases, these jobs should be routine.

MYRIAD OF DETAILS

As for detail, hard chromium involves more than any other form of electrodeposition. All types of expensive industrial parts (see Fig. I) are handled by the hard chrome plater and require, as a rule, selective plating – that is the plating of some specific section (see Fig. II) of a part. Adjacent areas, keyways, slots and threads must be protected without harm. This stopping-off operation requires much mechanical effort and must be so arranged to tie in with the electrical set-up – as uniform a distribution of current density as possible. The most inefficient plating solution in the field of electrodeposition, the chromium solution, forces a complete collaboration between the mechanical and electrical set-up. The rest of the details involving inspection, cleaning, pickling, heat treating, etc., will be included before the conclusion of this paper.

HEAT TREATING

Every now and then, something new is added to everyday shop routine that makes a tremendous difference in a previously satisfactory operation. Such is the case with heat treating in the hard chrome plating industry. Some years ago, heat treating was done only on parts that gave trouble, such as cracking. Now, the full significance of heat treating all work has been recognized. It has been proven beyond a shadow of a doubt that metals have more or less stress and strain ever present within its structure.

The Hydrogen embrittlement that accompanies hard plating, plus the accentuation of strain by the inherent physical characteristics of chromium, often results in an accelerated fatigue failure. Work done by the Navy department, plus X-ray studies, tend to show a complete removal of failures by the proper heat treating prior to plating.

Hydrogen, occluded during the plating operation (which can be minimized by a study of cleaning technique) is removed by a heat treating or bake after plating, at 350 degrees Fahrenheit, dependent upon type of job.

IMPROVEMENTS IN CLEANING TECHNIQUE

As long as we know of the deleterious results of hydrogen embrittlement, it is only reasonable to do something about it. Most cleaning is done cathodically, involving hydrogen at the work surface. By merely doing all cleaning anodically, we work with oxygen and eliminate the possibilities of hydrogen embrittlement in cleaning. All pickling should be done with wetting agents present to permit a more free passing off of hydrogen. All etching mediums chromic acid, sulfuric acid, etc., employ anodic treatments, automatically taking care of the elimination of hydrogen.

SOLUTIONS

1.	250 g/l Cr. 03	2.	400 g/l Cr. 03
	2.50 " H2S04		4.00 " H2S04

Temp. 113 F. to?
C/D. 150 to 500 Amps. sq. ft.

There is much conjecture as to which of the above solutions is best for hard chromium. We prefer the 400 g/l but the choice is left to one's discretion.

USE OF HARD CHROME

The limitations of the uses of hard chromium are few. Fig. I represents a miscellaneous group of parts picked at random from the receiving bench. Included are all types of machine parts, gages, dies, molds and broaches. The requirements of this collection includes the plating of outer and inner diameters, gears, insides, tops, and bottoms of splines, male and female.

Practically all concerns doing any drawing of copper, brass and steel go all out on the chromium plating of their dies and punches. The plate thickness for optimum results ranges from .0015 to .002 thick. This coating of hard chrome is applied to the new punches and dies and gives from three to five times the life of the unplated steel parts and when the coating shows signs of wear, it is stripped and replated. Thus, for the price of platin, you have a new punch and die. Forging dies, particularly when aluminum is the metal being forged have a bad habit of picking up and fouling. A good, polished chrome deposit of .001 thickness will eliminate sticking and prolong the life of the die.

Blanking dies have been known to last ten times longer and operate more efficiently when plated with .0005 thickness of chromium.

Gages of all types are now being plated by all the leading gage manufacturers in the country. These parts are usually ground .002 to .003 undersize, plated .003 oversize, then ground and lapped to size. Gages of this type give from three to seven times the wear of the best gage steels. Exhaustive comparative tests also reveal a more uniform wear than some of the special types of expensive materials used in some cases. When chrome plated gages are worn below the dimensional limits, they are stripped, replated and refinished. Some companies have been using the same gages year in and year out by employing these methods.

The all important aircraft engine manufacturers have come to rely heavily on hard chromium in salvaging expensive machined parts. Careful handling of parts as well as perfect stopping-off of areas adjacent to diameter to be plated, make hard chrome invaluable and inexpensive to the aircraft manufacturer.

Spindles and shafts for any type of machine are handled very nicely by hard chrome plating worn areas. In addition to salvaging the piece, it also gives a more durable and much longer lasting part. The worn and scored sections are ground uniform when necessary, plated oversize and ground to size. The beauty of salvaging "hard-to-get" machine parts

of this type is that keyways, slots, threads and other important sections of these parts are thoroughly protected and unaffected in any manner.

MOLDS FOR PLASTICS INDUSTRY

The plastics industry, one of the up and coming features of the modern manufacturing world, is already leaning heavily towards the hard chromium plater for preservation of his expensive tools and dies.

Due to terrific pressures, harsh abrasive action caused by rag, cotton flock, asbestos, graphite and a score of other fillers, chemical reaction from phenols, ureas, etc., high temperatures causing constant oxidation and numerous other reasons, the plastic mold receives terrific abuse.

Present naval specifications call for all plastic molds to be hard chrome plated. The largest manufacturers of plastic pieces already have ordered all molds be plated before being put into production.

A thickness of chromium of (.001) on thousandth of an inch applied directly to the base metal (as in all hard chromium plating) will usually last the life of the mold. Heavier deposits, up to .005 are applied to larger molds, such as those used in the manufacture of lamp shades, adding machine cases, radio cabinets, coffee grinder housings, etc. This added thickness is used because of added pressures, more flow and more wear. Pin breakage is reduced considerably by plating to eliminate fouling.

A brief summation of some advantages of plating plastic molds are as follows:

1. Eliminates breaking-in time of new mold because of low co-efficient of friction of chromium surface.
2. Reduces wear to a minimum.
3. More uniform flow of compound.
4. Free extraction of molded part.
5. Higher finish of molded part eliminating buffing.
6. Cleaner finish on white and colored materials.

GENERAL OUTLINE FOR HARD CHROMIUM SHOP

1. After receiving, the first step should be inspection, visual and dimensional.

2. A check of case history if supplied by customer. This will reveal composition of steel and whether or not previously heat treated.

3. Heat treat at 600 F. for 30 minutes.

4. Cleaning and pickling.

5. Physical preparation — Buffing-Lea and rouge.

6. Proper stopping-off and lacquering.

7. Racking, thieving, etc.

8. Alkali cleaning — anodically — at 50 amps. sq. ft.

9. Cr. 03 etching anodically 100 amps. sq. ft. time of etching determined by steel and type of job from 10 seconds to 10 minutes.

10. Proper current density.

11. Plating time determined by thickness of plate required.

12. After plating visual and dimensional inspection to be repeated.

13. Heat treating at 350 to 400 degrees F. for 2 hours.

14. Pack and ship.

CONCLUSION

In summing up the field of the electrodeposition of hard chromium as an aid to the war effort, we find the following facts:

1. A great preservative for new tools and parts.

2. It has no equal as a salvage medium.

3. Physical characteristics amazing when grouped together, namely: hardness, corrosion resistance, low co-efficient of friction, high resistance to heat, dense crystalline structure.

4. Has an adherence to base metal superior to that of any other electrodeposited metal.

5. Can be stopped-off cleanly on areas requiring plate and not affecting rest of part.

6. When worn, plate can be stripped without affecting base metal and new coating applied.

7. Advocated by metals conservation division of the War Production Board.

Equipment

By W. L. CASSELL

MacDermid, Inc., Waterbury, Conn.

VERY few items of plating equipment have been offered during the year 1942. One can easily understand this; particularly when we review conditions in the plating industry since even before Pearl Harbor.

The emphasis has been placed on improvements in existing equipment or on accessories designed to improve efficiency and production. In other words, equipment has been "streamlined." This development has been accelerated by the almost unanimous demand for specification plating, and the necessity for limiting installations of new equipment because of material shortages.

CLEANING EQUIPMENT

To plate to specifications with a minimum of rejects obviously entails perfect cleaning. In this connection, the writer has noticed increasing interest in washing machine equipment of all types. These range from the chain or table conveyor, high pressure spray types to the drum types with internal spiral conveyors. These latter are, in general, in two forms: the first consisting of a solid horizontal revolving drum with a scoop at one end to pick up the hot cleaner, pickle or rinses on each revolution; and the second consisting of a perforated horizontal drum which is partially submerged in the cleaner, pickle or rinses. There is a separate compartment for each operation, of course, and one drum dumps the work into the next progressively.

Then there is the horizontal barrel type resembling a plating cylinder but made of perforated monel or steel. In this type, the work is dumped into the cylinder (on a low level loading stand) and the unit carried with hoist and rail to a hot alkali tank, equipped with motor or belt drive to revolve the cylinder. From thence, the cylinder is carried by means of same hoist and rail through the various steps prior to

plating. All tanks are equipped with motor or belt drive to give maximum agitation. The work is transferred from the cleaning cylinder to a plating cylinder by means of a specially designed transfer stand, equipped with hoppers and gates. This type of unit has proved very popular for typical small barrel parts especially where loads are varied and must be kept separated.

New drum internal spiral conveyor washing machines are due to appear on the market in the near future. While these offer nothing new in principle, there will be certain features for which the manufacturer will claim increased efficiency and flexibility.

Of course, we are all familiar with the solvent degreaser in manual or automatic form. So far as we know, there has been no change in principle during the past year but, as with everything else, new applications are rapidly being made and special machines designed for the purpose.

AUTOMATIC BARRELS

Automatic plating barrels, as we know them today, are interesting developments. They are of two distinct types. In the first type, the perforated baskets holding the work are in the general shape of flat cylinders, with flat facets around the circumference. These baskets are mounted on horizontal shafts through the center and the shafts attached to a conveyor chain. The chain pulls the baskets which rotate through the solutions and from tank to tank by means of cams and rollers. In this type, all of the baskets are carried through the complete cycle.

The second type is the "walking beam" or "teeter" type, in which the perforated baskets are pear shaped and located on either side of a main frame which tilts first to one side and then to the other, as required, and all done automatically by means of timers and air or hydraulic cylinders. The baskets, which are continually rotating, are joined by chutes so arranged that the work progresses from basket to basket, from loading to unloading as the unit tilts from side to side. Loading and unloading can be made fully automatic, depending upon the type of work being processed. This unit can combine cleaning, pickling, rinsing, plating, drying, and some special operations such as bright dipping.

The baskets do not move from tank to tank but operate in only one solution and are, therefore, made of the material best suited to that medium.

There is a rumor that one company will soon announce an automatic barrel unit, making use of the familiar horizontal barrel.

AUTOMATIC BULK HANDLING EQUIPMENT — GENERAL

Under this heading we include such automatic bulk handling equipment which does not include a plating cycle. There are several types manufactured by the Udylite Corporation and each was originally designed for a specific purpose.

Possibly, all such types are now superseded by the unit which was originally announced as an automatic Parkerizing Machine. The machine is adaptable to many uses, such as cleaning, pickling, rinsing, parkerizing, oiling, drying, and other chemical treatments within its scope, and where the work does not have to be constantly agitated by tumbling.

This is a progressive type automatic unit in which the horizontal perforated baskets or hoppers are long and wedge shaped, open at the top. In the ordinary design, the odd numbered baskets are connected to an air or hydraulic cylinder by means of a rack and gears while the even numbered hoppers or baskets are attached to another rack independent of the first, but both actuated by timers. The work is placed in No. 1 hopper and from thence, progresses through No. 2, No. 3, etc., at intervals depending upon the timing. This unit is quite versatile and within limits can be made to do some interesting tricks.

FULL AUTOMATIC PLATING MACHINES

This section deals with the automatic unit designed for racked work which, but for volume, would ordinarily be done in a still tank or semi-automatic.

There have been no radical changes in the design of these machines, which are familiar to all platers, but decided improvements have been made; particularly in the stop and go elevator types. One of these incorporated an ingenious device which agitates and rotates the work during the plating operation.

There is one fairly new device in this field. It is known as the Crown Pick-up Unit. In principle, it is not new but it has been designed and adapted principally to automatic handling before and after plating. It is

true that any automatic type unit can be so applied, but so far as we know, this is the first of its peculiar kind.

SEMI-AUTOMATIC

Semi-automatic or Moving Cathode plating machines have not changed in general. New devices have been added for particular jobs where extreme agitation is required, but nothing for general adoption.

RINSING — DRYING

There has probably been less change here than at anywhere along the line. Rinsing hoppers that dump from one to another manually or automatically are not new. There is nothing new in centrifugal dryers; that is, for the ordinary average user. Some improvements have been made in drying equipment for automatic handling, but these are special and are designed on the job.

ANODIZING

About the only new thing here is the fact that users and students of Chromic Acid anodizing seem to be coming closer to common ground in their ideas concerning proper equipment, agitation, time of processing, etc. Some very nice automatic equipment has been installed during the past year. Improved methods of racking and handling have greatly increased production in the same tank.

So far as we know, there are no new equipment angles to Sulphuric Acid anodizing. This process is tightly controlled, and we have no late knowledge of any changes in requirements as compared to six months ago.

FILTERS

Here again — nothing new; but general improvement, not only in the equipment but also in knowledge of what the equipment will or will not do.

TUMBLING AND ROLLING

There is one new process of outstanding merit, the success of which is due in no small degree to proper equipment design. While, strictly

speaking, it is a process, its success depends largely upon a certain size and style of tumbling unit. The process is known as Roto Finish, and we understand that it has been unofficially rated as one of the outstanding developments of this period.

The process was originally developed to furnish mechanically and in bulk, a surface on metals to compete with polishing and buffing prior to electroplating. The war stopped that and now the main call is for grinding burrs or rounding edges without other serious dimensional changes.

In one case, through the use of this equipment and method, several hundred men were released from hand filing operations on fairly close tolerance precision parts to more profitable work.

While Roto Finish is mainly a burring operation, it does not often compete with the Lea Method of burring by means of conventional or special wheels and special compound. On the contrary, Roto Finish is a mass operation while the Lea method is a hand operation which is used mainly where burring must be accomplished with extreme precision.

STRIP PLATING

The really big accomplishment of the past year in this field has been in the switch from hot tin to electrolytic tin by means of continuous strip plating methods. The equipment idea is, of course, not new, but new wrinkles have been necessary to accomplish the result. For instance, an amplidyne current regulator helps hold current density accurately proportional to strip speed. Photo electric-amplidyne apparatus is used to keep rolls winding with ends square. At 300 feet per minute, this little feature is important, as without it it would not take long to have tinned sheet wrapped around the operator's neck.

To those of us accustomed to think in terms of units of 5,000 amperes or multiples thereof, the current requirements of one machine are startling — 60,000 amperes and all furnished by rectifiers.

Another wrinkle in connection with tin strip plating or hot tin plate is the use of short wave inductive heating of the tin plate to obtain rapid flow and less porous coatings. Speed of the strip automatically controls the degree of inductive heating.

RECTIFIERS

Rectifiers have been in use many years and, prior to 1942, had found acceptance in the electroplating field. During 1942, however, rectifier applications have soared, due partly to inability to obtain generators within a reasonable time.

Applications run the whole range of plating and anodizing and are doubtless familiar to all. They are readily adaptable to automatic control for chromic acid anodizing.

AGITATORS

New equipment and methods of agitation designed to greatly increase plating speed in certain fields are under development, if not already in application, at least experimentally. The method employs improved agitators with so called directional agitation. Current densities are sharply increased, but the method entails continuous filtration to insure perfectly clean solutions; larger current supply per unit and, of course, heavier copper and controls.

In conclusion, we may sum up the subject in a very few words: i.e. — there is very little new equipment, but what there was has been improved and applied to new fields. Of course, the writer may easily have overlooked or probably has never heard of some very worthwhile ideas. However, we have written the principle manufacturers of equipment and without exception their answer was in general "nothing new — but improvement all along the line."

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The Fundamentals of Electrochemistry and Electrodeposition

Part XV. Hydrogen Overvoltage and its Importance in Metal Deposition

By SAMUEL GLASSTONE, D.Sc., Ph.D.
Professor of Chemistry,
The University of Oklahoma, Norman, Okla.

IN the previous article some consideration was given to the question of the order in which two or more metals will deposit from a solution containing several ions. One very important aspect of this problem arises, to an extent which depends on circumstances, in all forms of electroplating, because every aqueous solution contains hydrogen ions. In a sense, therefore, there is always a possibility that hydrogen gas will be evolved at the cathode; if this actually occurs, the current efficiency for the deposition of the metal will decrease accordingly. It is a matter of great interest, therefore, to consider more closely the conditions under which the liberation of hydrogen gas is possible. Incidentally, this discussion will provide an opportunity for referring to the subject of hydrogen overvoltage.

HYDROGEN EVOLUTION POTENTIALS

As already mentioned, a metal which behaves in a reversible manner will commence to deposit from a given solution when the potential of the cathode attains a value approximately equal to the equilibrium potential in that solution. The same rule should apply to hydrogen evolution, and hence the "deposition potential" for the liberation of gas at atmospheric pressure and normal temperature will be given by the equation

$$E = 0.059 \log [H^+], \qquad (1)$$

where $[H^+]$ stands for the concentration of the hydrogen ions in the particular solution employed. This equation is a form of the one given at the beginning of Part XIV (*Monthly Review*, December, 1942); the simplified form just given arises from the fact that the standard potential

(E_0) for hydrogen is zero (see Part XII) and the valence (z) of hydrogen ions is unity. Making use of the approximate definition of pH as $-\log [H^+]$ (Part VII, Feb., 1942), it follows that equation (1) for the reversible potential of hydrogen gas evolution can be written as

$$E = -0.059 \text{ pH}. \qquad (2)$$

In other words, if the pH of the solution is, for example, 8.2, the potential for hydrogen evolution, expressed on the usual hydrogen scale (Part XII), should be $-0.059 \times 8.2 = -0.484$ volt at about 22° C.

HYDROGEN OVERVOLTAGE

If a study is made of the potentials at which visible bubbles of hydrogen gas are observed to form at a cathode, it will be observed that the experimental potentials are not in agreement with equations (1) and (2). In nearly every case, it is found necessary to apply an excess potential, or "overvoltage" (see Part XIV), before the gas begins to be evolved. This overvoltage is almost independent of the pH of the solution, but depends on the nature of the metal of which the cathode is made. The equation (2) giving the potential for hydrogen evolution must therefore be modified to allow for the overvoltage, and it becomes, at ordinary temperatures,

$$E = -0.059 \text{ pH} - V, \qquad (3)$$

where the overvoltage V varies with the nature of the metal (see below).

The magnitude of the overvoltage depends on the current density expended in the discharge of hydrogen ions, but for the purpose of the present discussion it will be sufficient to consider the overvoltage corresponding to the point at which visible formation of hydrogen gas commences. This was at one time referred to as the "minimum overvoltage," but as the expression is regarded by some as being misleading, it may be called the "bubble overvoltage." It is defined as the numerical difference between the actual potential of a cathode when the evolution of hydrogen bubbles becomes visible and the theoretical equilibrium, or reversible, potential in the same evolution. For example, when a solution of 0.1 normal sulfuric acid is electrolyzed with a zinc cathode, the potential for visible hydrogen gas formation is found to be about –0.76 volt. The pH of the given solution is about 1.0, and so by equation (2) the theoretical potential for hydrogen evolution is –0.059 volt. The numerical difference between the experimental and the theoretical

values is 0.70 volt, and this is the hydrogen overvoltage at a zinc cathode at ordinary temperatures.

By working in the manner indicated in the previous paragraph, it has been possible to determine hydrogen overvoltages (cathodic overvoltages) at various electrodes. The results for a number of common metals are recorded in the table.

Hydrogen (Bubble) Overvoltages at Ordinary Temperatures

Silver	0.15	Cadmium	0.48
Cobalt	0.16	Tin	0.53
Iron	0.18	Lead	0.64
Nickel	0.21	Zinc	0.70
Copper	0.23	Mercury	0.78

Utilizing these figures, together with equation (3), it is possible to calculate the potential for hydrogen evolution at a given electrode in any aqueous solution of known pH. Consider, for purposes of illustration, a solution of pH 5.0 which is being electrolyzed with a nickel cathode. The hydrogen overvoltage at ordinary temperatures is 0.21 volt, and hence the potential for evolution of the gas is given by

$$E = -0.059 \times 5.0 - 0.21 = -0.50 \text{ volt.}$$

On the other hand, if the cathode had been made of zinc, the hydrogen evolution would be deferred until a potential of about −1.0 volt was attained in the same solution.

DEPOSITION OF ZINC

It is of interest to consider next what effect overvoltage has on the current efficiency for the deposition of various metals. Suppose a solution containing about 1 mole of zinc sulfate and 0.1 mole sulfuric acid were used for zinc plating; apart from addition agents, this would not represent an unusual type of bath. The theoretical (reversible) potential for the deposition of zinc will be about −0.76 volt, while that for hydrogen evolution should be −0.06 volt, approximately. In view of the remarks made in the previous article, it will be expected that electrolysis of this solution should give hydrogen gas only, and no zinc. Fortunately, overvoltage changes the picture completely. The potential for the discharge of zinc ions remains unchanged, but the overvoltage for the liberation of hydrogen at a zinc cathode is so large (0.70 volt) that

the evolution of the gas is delayed from —0.06 to —0.76 volt. The potentials for the liberation of zinc and hydrogen are thus about the same, and so zinc can be deposited. By raising the current density the overvoltage of the hydrogen is increased somewhat, and so its evolution is still further retarded; the current efficiency for the deposition of zinc is thus increased. The same effect may be achieved by increasing the pH, for as equation (3) shows this raises the potential for hydrogen evolution. There is, of course, a limit to this increase, for if the solution is not sufficiently acid there is a danger of zinc hydroxide being precipitated. Attention may be called to an important point in relation to this problem. In calculating the hydrogen evolution potential it was assumed that the cathode was already covered with zinc. If this were not the case, the potential would be much lower. If the cathode were of copper or nickel, for example, the hydrogen evolution potential in the solution referred to would be about —0.27 volt, which is much below that for zinc deposition. In a case of this kind, it would be very difficult to start the zinc plating out, although once it had started it would continue readily because of the high overvoltage for hydrogen evolution. However, if the cathode were given a strike of zinc, or mercury, which, as the table shows, has a high overvoltage, little difficulty would be experienced in depositing the zinc.

OVERVOLTAGE AND NICKEL DEPOSITION

Another interesting case is that which occurs in the deposition of nickel. As seen above, after allowing for the cathodic overvoltage, the evolution of hydrogen at a nickel cathode from a solution of pH 5.0 should commence at about —0.50 volt. According to the table of potentials given in Part XII, nickel deposition should occur at approximately —0.25 volt. However, in this case there is a further complication, mentioned in Part XIV, for there is an overvoltage for nickel deposition which raises the discharge potential to about —0.50 volt. The plating out of the nickel will thus be accompanied by the evolution of some hydrogen, and the current efficiency for metal deposition will be less than 100 per cent. This efficiency can be kept high by increasing the pH and the current density, within limits, for both these factors make hydrogen evolution more difficult. Raising the temperature has a similar effect, for it decreases the overvoltage for nickel deposition more than it does that for hydrogen evolution. Similar considerations apply in the deposition of iron and cobalt.

Recovery of Thinners and Solvents An Important Factor to Our National Defense Effort

By A. B. CRANE
A.B.C. Chemical Co.

THE Plater and Metal Finisher has been called upon to salvage practically all of the materials he uses in order that the plants may keep in operation. The old law of economics, balancing the cost of new materials against the cost of recovering used materials has out of necessity been thrown out the window.

Salvage is necessary for the continued operation of the Finishing Department. Recent improved methods and equipment make it possible to recover thinners and solvents that have been used for washing and stripping and return them in a condition comparable to new solvents. This improved method makes it possible for the small consumer to take the same advantage of the saving offered as the large consumer.

Mr. S. Donald Perlman, head of the Industrial Salvage Section, Conservation Division, of the War Production Board recently authorized a release on the necessity of reclaiming solvents, cutting oils, hydraulic oils, etc. Any one interested in the recovery of such materials, who has not received a copy should contact Mr. Perlman. This division maintains a Field Force which surveys and advises plants on the recovery of this type of material but in spite of their efforts there are still many thousands of gallons of solvents destroyed or thrown away each year. Much has been written in recent months regarding the recovery of

solvents and we are hopeful that this will come to the attention of some who are not yet familiar with what may be done in the way of recovering these valuable and scarce materials. We urge that all users of such materials thoroughly investigate recovery possibilities both from the patriotic and economic points of view.

In general solvents can be divided into two classes. The first acetone, toluol, ethyl acetate, alcohol, etc., which are lacquer thinners. Such solvents that have been used for washing and stripping purposes, can be recovered and returned to a water white, neutral condition and with a moisture content comparable with the original product. The recovery will often average higher than 90%. Highly contaminated lacquer solvents should no longer be discarded.

The second type of solvent includes carbon tetrachloride, trichlorethylene, perchlorethylene and ethylene dichloride most widely used as degreasing solvents. In most cases such solvents are used in especially constructed degreasing machines. The degreaser recovers a large portion of the solvent through distillation, accumulating the dirt and oil in the sump. This sludge is discarded when it becomes apparent that no more solvent can be recovered. This discarded residue will usually yield 20% to 35% solvent.

By proper methods of distillation in properly controlled recovery plants these degreasing solvents can be returned water white, free from acid and in general comparable with the original material.

Oil is another material used in large quantities in industry. These oils may be cutting oils, hydraulic oils or machine oils. Continued use of oil may increase the acidity which will change the lubricating properties; increase the bacteria content which may lead to dermititis, it may pick up fine metallic chips or dirt which may cause excessive wear on the machine parts. Oils may also pick up enough moisture which will emulsify and cause corrosion of the parts. Most industrial oils used for cutting are recirculated either in the individual machine or are recirculated to sumps which handle the lubricant for the entire depart-

ment. In either case the contamination becomes serious enough in a short time so that the material must either be Re-Refined or discarded.

The above mentioned types of contamination can be removed by proper re-refining methods and returned to the user comparable with the original oil purchased.

The re-refining methods include contact with a diatomaceous earth or decoloring agent, distilling off volatile constituents such as moisture and solvents, sterilizing and filtering as a final clarifying operation.

This method of recovering oil is available to the small operator as well as the largest user.

The several companies who are equipped for such salvage operations can determine the problems involved by the receipt and testing of a small sample. Every one who has materials which might be salvaged, is urged to forward samples to one of these recovery plants for their recommendations.

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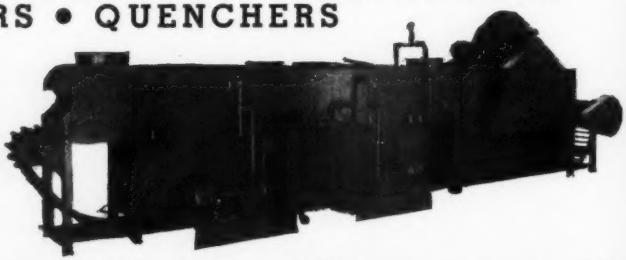

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Motor Generator Sets and Rectifiers In the War Effort

By C. E. BERGER
Assistant Chief Engineer,
Hanson-Van Winkle-Munning Co.

MODERN warfare is a titanic struggle between people of different idealogies, and the victor will be those whose people on the home front are best equipped to produce more and better machines for the men at the front.

Electroplating in some form or other plays an important part in the tools of war as well as in the machines which produce those tools. One of the most essential parts of an electroplating process is a suitable source of current, and it is with this part that we are principally concerned.

The usual suppliers of motor generator sets and rectifiers for electroplating service find their manufacturing facilities completely absorbed by the production of this and similar equipment, and it is well to consider at this time the maintenance of present installations of motor generator sets and rectifiers.

TO THOSE WHO OWN MOTOR GENERATOR SETS OR RECTIFIERS

To those of you who own equipment of this type and are not using it, and will not have any use for it in the war effort, let me say that the sooner you arrange to make it available to those who do need it the better it will be for our common good.

If you own such equipment and are using it, the more closely you follow the manufacturers instructions as to its care and operation the less likelihood there will be of breaking down or failing at a critical time. Basically the point which all manufacturers stress is "cleanliness." Whether your equipment is in generators or rectifiers this is sound

advice. Motor, generator and exciter windings should be thoroughly cleaned and kept clean as frequently as the location demands. Rectifiers also should be checked frequently so that dust, dirt or lint does not interfere with the ventilation of the unit. On rotating equipment use the make and grade of brush specified by the manufacturer — making sure that they move freely in the brush holders and properly fit the commutator. Brush pressures are important and should be adjusted to the manufacturers recommendation by actual measurements with a spring scale and not simply guessed at. If you are using rectifiers observe the manufacturers recommendation as to allowable operation voltages and current overloads and do not permit them to be exceeded. If you have generators which were built to 25°C or "heavy-duty" standards and have continuous overload ratings, go ahead and use them at these higher ratings if needed, instead of demanding more capacity. In other words, take good care of the equipment you have and load it up to full capacity so that the new equipment being produced may be used in the places of the greatest need.

TO THOSE WHO NEED NEW OR ADDITIONAL CAPACITY

If your plant requires new or additional generator or rectifier capacity estimate your requirements carefully and conservatively. What started out as a reasonable estimate of the required capacity is likely to result in a size 50% or more too large if several people all add cumulative "safety-factors."

Your suppliers have standard ratings which are more readily produced than special ratings. Stick to them and do not ask for special ratings when standard ratings can be used. Cut out all the "gadgets" even though the D.P.C. is paying for it — they are hard to get. Limit your specifications for meters to the bare minimum — no meters are required in the A.C. supply and two meters are sufficient for any rectifier or induction motor driven set or three for any synchronous motor driven set. Circuit breakers in the D.C. line, recording voltmeters, ampere hour meters, special push-button stations and similar equipment all can serve a useful purpose but should not be specified unless absolutely necessary to the successful operation of your process.

If you are fortunate enough to secure a new piece of equipment, follow the manufacturers instructions implicitly as to location, operation and maintenance of the unit — but by all means *KEEP IT CLEAN!*

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Development of Cleaning Materials in 1942

By ROBERT SIZELOVE
Technical Advisor,
Frederick Gumm Chemical Co., Inc.

THE year of 1942 has seen many changes in types and applications of cleaning materials due to the needs of our War Production. Also there have been tremendous improvements in materials used for certain applications which have continued and increased since pre-war days.

The request of the War Production Board to conserve as much chlorinated degreasing solvents as possible has expanded the use of emulsifiable organic degreasing substitutes. Emulsifiable solvents are used various ways. First, they can be used undiluted at room or tepid temperatures followed by rinsing operations. Secondly, they can be used diluted, followed by rinsing operations. Thirdly, they can be used at concentration of 1-4 fluid ounces per gallon in spray-type or rotary tumble type washing machines. Solvent emulsion cleaners are in general more difficult to rinse than alkalies; but sufficient rinsing operations can be provided for production work to take care of this. This apparent difficult rinsing also provides the advantage of easy rust-proofing of steel parts. Work cleaned with emulsifiable solvents are not water-break free — that is — these parts are physically clean but not chemically clean. This is very desirable for subsequent enameling or storage operations.

In the following paragraphs is a brief description of methods used for metal preparation of various Ordnance Matèriel.

The cleaning of brass shell cases has introduced the use of high concentration, high-speed soaking alkalies which will remove heavy mineral oils and sulfonated oils with a cleaning time of fifteen seconds or less. Previously, these same type of oils required two to five minutes for cleaning. Degreasing is also used for brass cases.

Brass cartridge cases of 30 calibre, 50 calibre and 20 mm sizes are

cleaned with rotary tumble and spray-type washing machines with either alkalies or diluted solvent emulsions.

Steel shell cases of large sizes are cleaned by degreasing; also with spray-type washing machines using either alkalies or diluted solvent emulsions and also with heavy duty soaking alkalies. The drawing compound to be removed is usually of the heavy-pigmented type.

Shell projectiles are cleaned with degreasing or with solvent emulsion cleaners.

Shell fuze parts made of aluminum are cleaned with degreasing or with mild soaking alkalies. Alkalies seem to be preferable due to the deterioration action caused by the aluminum upon the degreasing solvent. The deterioration can be eliminated by the proper operation of the degreaser.

One development which has saved many, many man-hours of labor on Ordnance Materièl is Barrel-Deburring. Aeroplane, truck and car motor parts as well as Rifle, Machine Gun and A.A. Gun parts of sizes up to 2″ x 2″ x 12″ are barrel processed to remove milling, drilling and sawing burrs. These parts were formerly hand-filed or wheel-polished with greaseless compounds. On parts larger than mentioned, greaseless compounds are now and will continue to be used to replace hand-filing. However, over 75% of the total quantity of parts which must be deburred are of the size and shape such that Barrel-Deburring can be used. In one particular instance, barrel-deburring produced 2300 parts in 7 man-hours to replace hand-filing which required 350 man-hours.

There is a tremendous application for Parkerizing and Bonderizing on Ordnance Matèriel made of steel. These parts are cleaned by degreasing or using soaking alkali cleaners. It has been found that the alkali must be very free rinsing to give a surface satisfactory for Bonderizing or Parkerizing. The introduction of Parco Lubrite on Ordnance Matèriel has caused the development of new cleaning compounds which no doubt will be further improved during the coming year.

There is also a tremendous application for sulfuric and chromic acid anodizing of Ordnance Matèriel. Aluminum parts are cleaned prior to anodizing by either degreasing or alkali soaking. Some plants anodize directly on a degreased surface which is not water-break free with no apparent ill-effects. This is contrary to the conception of many in the plating fraternity who are accustomed to seeing work water-break free

before processing same. Racks used for anodizing are stripped of the oxide coating after each cycle. This has promoted the development of non-caustic materials for stripping the racks without attacking the aluminum. This development has saved much aluminum which might otherwise go down the sewer.

Practically all of the above discussion pertains to work which very few platers or metal finishers were doing one and one-half to two years ago. The peace-time pursuit of cadmium plating: acid and cyanide zinc plating; heavy silver plating and hy-speed copper plating have increased many fold during the past year. This increase has been reflected in the further development of high-speed alkaline cleaners for smut and oil removal. This type of cleaning is very essential prior to copper and cadmium plating to insure maximum adhesion of electro-deposits.

Cleaning procedures have improved and changed so fast during the year 1942 that I imagine the above information will look like distant history one year from now.

• CHEMICAL RESISTING EQUIPMENT •

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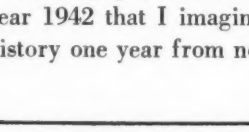
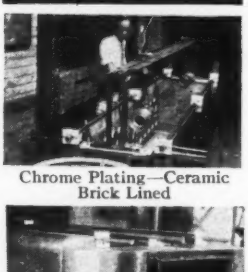


Chrome Plating—Ceramic Brick Lined



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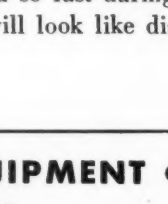

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Silverplating, Its Place in the War Effort

By F. C. MESLE
Oneida, Ltd.

SILVER is not yet considered a strategic metal, therefore, is available as a substitute for many of the so-called strategic metals that are so urgently needed in our all out war effort.

In many instances, electroplated silver is being used as a substitute for such metals as copper, nickel, cadmium, zinc and the copper, nickel, zinc alloys; and in some cases for stainless steels.

Iron or steel kettles, tanks and piping are lined with silver by electroplating for the chemical equipment industry. Silver lined cans, barrels and milk handling equipment are used as a substitute for tin on these items.

Silver plated steel is being used as a substitute for articles formerly made of nickel silver, and brass; knives, forks, spoons and other articles of tableware are among the items now being made in large quantities. The silver is deposited direct on the steel base. The specified thickness is from .0005 to .001″ of silver.

Silver is being plated on a variety of electrical contact devices for the many and varied instruments that control our war machines and communications, so essential to the conduct of the war.

Shafting, bushings, washers, rings and a host of similar articles that have in the past been made of bronze, are now being made of steel silver plated, thus saving tons and tons of copper and tin.

The above mentioned items is an indication of the place electroplated silver has in our war effort as a substitute for the more strategic metals.

In some of the cases referred to above, silver plating as a substitute does not produce as good a product as the metal it seeks to substitute. This is especially so in the case of silver plated steel tableware. In this case the silver is intended to do a two fold job.

1. Give a pleasing appearance to the article.

2. Protect the article against corrosion.

The appearance of silver is satisfactory, but it is not the best metal to protect the steel – base metal and can only do so when the silver is plated to a thickness of around .001″ on a reasonable well finished surface; it is almost impossible to do this at the price the trade or the Government is willing to pay for such articles.

In other cases the substituted silver plated steel articles are an improvement over the metal formerly used. New fields are being opened for the electroplating of silver in which electroplated silver is not only a substitute for the more strategic metals, but is actually an improvement.

One of the very interesting cases is in the manufacturing of bearings for air, sea and land war machines. In this case it does replace copper lead alloys, but the more important reason for its use is that silver is a better metal for this purpose.

Silver has been accepted as a good bearing metal especially when a thin deposit of lead and Indium is put on the silver for all our war machines, so that we now have "clouds of planes with silver linings."

Silver has been applied to the steel shell of a bearing by casting with considerable success, but more and more the trend is toward applying the silver to the steel bearing shell by electroplating and many thousands of bearings for our war machines are being electroplated with silver to a thickness of from .020″ to .060″. Oneida Ltd. has deposited from three to forty-three oz. silver per bearing. Present indications are that the demand for such electroplated bearings will be on the increase until our war effort shall have resulted in complete victory. No doubt electroplated bearings will continue to be used in quality airplane engines and may also become standard equipment for all quality automobiles after the war is won.

Electroplated silver finds a very vital place in our war effort in its application to bearing plating.

The demand for a thick smooth deposit of silver, with a perfect bond to the steel shell, calls for the best plating equipment and processing the skilled plater has at his command.

Another important use for electroplated silver in our war effort is in the manufacture of reflectors.

WOOD, METAL, PLASTIC?

JEEPS, PLANES OR SHELLS?

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INDUSTRIAL FINISHES

Plating With Precious Metals In Wartime

By K. SCHUMPELT
Baker & Co., Inc.

AT the time that this article is written there are only two precious metals left on which the government so far has not placed any restrictions. They are gold and palladium.

Gold plating in all its aspects is sufficiently familiar to the plater and has been treated in so many articles that it seems unnecessary to go into details. Gold solutions of the cyanide type are so flexible that they can be readily adapted to almost any particular problem. For purely ornamental yellow finishes gold is still widely used. The time, however, is approaching when the use of suitable base metals for non-essential goods such as jewelry and novelties will be greatly reduced if not prohibited.

Of increasing importance is the use of gold plating as a protective coating against corrosion.

In such cases heavy deposits up to several thousandths of an inch can be applied and gold solutions of high metal content are used. The inherent density of gold deposits can be further improved by intermediate scratch-brushing or burnishing operations.

A suitable gold bath for producing heavy and dense deposits is the following:

Fine gold (in form of potassium gold cyanide 67%) ..	10g
Potassium hydroxide	20g
Sodium or Potassium sulphite.....	20g
Potassium cyanide	10-20g
Water	1 liter

Use this bath at 70°C or over with steel anodes. Keep the current below the gassing point corresponding to 1½ volts. Under these conditions 120 milligrams of gold are deposited per ampere minute, which is close to the theoretical efficiency for monovalent gold.

An increasing field for gold plating is opening right now for military buttons. In peace time most of these buttons were made by the fire gilding process, using gold amalgam. This seemed to be the simplest and safest way to obtain a uniform deposit of the specified amount of gold per dozen buttons as well as the color and hardness prescribed by the Army. However, with the increasing demand of today there seems to be a definite trend to replace the fire gilding process with electroplating. A shortage of mercury and the danger to the health of the workers may explain this change. In electroplating military buttons it is of course understood that racking or wiring methods cannot be used. Besides the labor involved, the distribution of the gold deposit would not be uniform enough to meet the government specifications. In most cases barrel plating methods have been adopted to give satisfactory and consistent results.

A large amount of gold is used annually for the plating of small parts in telephones and other electrical instruments.

Of the metals of the platinum group only platinum and rhodium have been used on a large scale for plating and finishing up to recent times. Due to the necessities of war, the plating with platinum and rhodium has been drastically restricted. Very few exceptions have been allowed in cases where requiremnts of health or other vital functions were involved.

Large amounts of rhodium are used in the plating of searchlights and other reflectors for Army use. Specific data on the procedure and the specifications can not be given at the present time.

With practically all the metals heretofore used for protective or ornamental plating placed on high priority ratings, it is suggested that renewed attention be paid to palladium.

Palladium, a sister metal of platinum, is available in large quantities. The possibility that it also may be rationed would appear to be remote. Palladium in its appearance and in many physical properties to some extent resembles nickel. The hardness and color are nearly the same.

The price of approximately $24.— per ounce for palladium in metallic form would not seem prohibitive in these times of emergency.

Palladium can be plated directly on practically all metals either from acid or alkaline solutions. Some of the acid solutions are self-sustaining as the metal can be drawn from palladium anodes. The alkaline solutions, however, seem to give somewhat denser deposits. After the discontinuation of platinum and rhodium for non-essential ornamental finishes palladium has been gaining more and more ground. It is our belief that it also can be used in many instances as a protective coating where nickel and chromium have been ruled out for the duration.

Whenever articles made of silver are to be gold plated palladium can serve as an underplate instead of nickel to prevent the diffusion of the gold into the silver.

Ready-prepared palladium plating solutions are now on the market which can easily be adapted to solve many problems with which the plater is confronted today. The metal itself in solid or sponge form as well as a number of salts is also available without restriction.

Palladium Plating

THE ANSWER TO WAR-TIME RESTRICTIONS

WAR restrictions upon the use of plating metals generally have focussed attention upon palladium to meet the emergency. Although a sister metal of platinum, it is not a strategic material and there fortunately is an ample supply. In color, palladium resembles nickel. It is untarnishable, with a hardness about equal to that of nickel, can be plated directly upon practically all metals and can be used to replace nickel and chromium in many applications as well as an underplate on silver, which is to be plated with gold, to prevent diffusion of the gold into the silver. We can supply you with palladium plating solution, salts or the metal itself in solid or sponge form and shall be glad to answer any questions you may care to ask us.

BAKER & CO., INC.

113 Astor Street Newark, N. J.

The Birthplace of Rhodium Plating

Finishes That Go to War

By J. E. E. GRIFFIN

Zapon Division—Atlas Powder Company

DUE to the enormous requirements of the War effort, manufacturers are forced from day to day to seek substitute materials, or to manufacture products to meet extreme conditions not previously experienced. In other words, the War effort is demanding an immediate reply from many manufacturers to the complicated problems arising due to the terrific demand for materials, for which in many cases, through lack of some component or another, substitutes must be found.

The finishing industry is playing a vital part in the War effort, for there are comparatively few items that do not require a finish in some form or another, from the smallest gauge ammunition to the largest bombing plane carrying Uncle Sam's reply to the Axis.

Finishes play an important part in all these items. In many cases the failure of the finish would mean, perhaps not the immediate failure of the piece in question, but at least a very much more rapid failure than would normally occur under the usual conditions of use.

To show graphically the enormous importance that the finishes themselves play in this War effort let us take a few items familiar to everyone, such as helmets, shell cases, aircraft, buckles, and gas tanks. If the average man thought about it at all, he might think that all that was required for a helmet would be to slap on a coat of paint, probably in some greenish color, and let it go at that. However, that is far from being the case. To begin with the finish must be specially formulated to give good adhesion, to stand up under the abuse that a helmet will take in service, to be of the correct camouflage color, and what is most important, to have the correct infra-red reflectance.

Again, in going back to our average man, camouflage color, as long as it blends with the surrounding country side, should be all that is required. However, under today's advanced methods of modern warfare, scouting and reconnaissance photography over enemy country is usually

done with cameras equipped with special infra red filters to pick out objects, that while appearing camouflaged to the human eye, will nevertheless show up through the infra red filter. This happens because the wave length of light reflected from the so-called camouflaged object is different to that of the object with which it is blending. Consequently standards have been set up so that the helmet, and also other similar finishes will conform to this requirement. In other words, the manufacturer is faced with an entirely new problem here, which he was not required to meet in peace time. The pigments used to give the required color must be of such a nature that the light waves that they emit when viewed through the infra red filter will be the same as those of the surrounding objects. How this is done is naturally a technical subject and will not be gone into here, but sufficient to say that here is an example that we find of finishes having to conform with what might be termed "ultra special" requirements.

When reading of our modern rapid-fire anti-aircraft and anti-tank guns as well as the rapid-fire cannon mounted in our planes, the average man probably envisages a stream of highly polished brass cases, each loaded with a deadly charge, pouring into the gun, and then being ejected after firing.

However, we all know that brass is one of the scarce items, and consequently the Government has been calling for drawn steel shell cases. Here again the manufacturers have had plenty of experience in coating steel in peace time, but the requirements that the War effort calls for are something else again. The material that is used for coating steel shell cases must be non-thermoplastic; that is to say, when the shell is placed in the gun and fired, the coating must not soften under the terrific instantaneous heat that is generated from the explosion, thereby causing it to stick in the chamber of the gun, or to clog up any of the breech mechanism.

It must also stand the effects of the explosives with which the shell cases are loaded without deteriorating, as were this to happen there would be an immediate reaction between the steel and the explosive causing a weak spot in the case, and a consequent irregularity upon firing which would mean that our shells would not accomplish their prime mission, which is to land squarely upon the target at which the guns are aimed.

This finish must also be capable of withstanding considerable abuse in handling, must naturally have good adhesion to the metal, and must not be affected by moisture, salt spray, mild caustic solutions, or oil,

and must yet be elastic enough to withstand a crimping operation around the top edge of the shell case once the shell itself has been inserted. So here again you see the manufacturer is faced not only with the normal problems for coating steel that he had in peace time, but in addition has to meet entirely new and considerably more complicated requirements.

Aircraft, to the average man means flying fortresses, dive bombers, fighter planes, transports, and perhaps in some instances even gliders may be included by him in this category. To the average man perhaps their importance is their great carrying capacity, their fine motors, and their fire power, but were he to pick up a piece of plywood, 1/16 inch thick, and be told that this was used in the manufacture of planes and gliders, he would undoubtedly be most skeptical. The idea of wood in aircraft would probably take him back to the old type planes used in the last War, that were not only slow and cumbersome, but certainly had not a fraction of the strength that modern aircraft possess.

However, resin bonded plywood is now coming into its own in the manufacture of aircraft. Not only in the comparatively slow flying gliders, and training planes, but also in actual combat planes and bombers. The British have shown that this is entirely practical by building one of their fast bombers designated as the "Mosquito" entirely of plywood, and we ourselves are incorporating plywood into many of our planes that Mr. Average Man considers to be fast flying pieces of light metal.

Naturally you cannot build aircraft of plywood and let them go at that. The plywood has to be finished, and here again a special type of finish to meet strange requirements has had to be formulated.

The first and most important requirement is moisture resistance. Moisture entering into a plywood plane will do more harm than enemy bullets. These will merely go straight through, whereas moisture will seep in and cause the wood to split. This will not be apparent immediately to the naked eye, but structural defects will occur which might result in a fatal failure at a crucial moment. Consequently, the manufacturer has had to produce a finish that will give the highest possible moisture resistance, and yet at the same time keep this finish low in weight. The finish has also to give sufficient build so that the final coats are so smooth as to offer a minimum of wind resistance. The speed of a plane may be affected by as much as 10 to 12 miles an hour by an improper finish, and this may easily be the margin of difference between victory or defeat for one of our planes.

LEA BURRING METHOD

. . . AN A

HOW would you remove the burrs on a gear such as illustrated? By filing? A hand burring tool? Emery cloth?

Recently a manufacturer sent us a large alloy steel bevel gear for our recommendations as to how to remove the burrs. After considerable study and experimentation the proper combination of Lea Flexible Wheel and Lea Composition was worked out. The Lea Burring Method is now being used in that gear manufacturer's plant.

Maybe war production in your plant is bringing to light burring problems. Maybe it's a small bushing—a crank shaft—piston ring. Whatever its nature or size, the Lea Method of Burring may be the only way to cut

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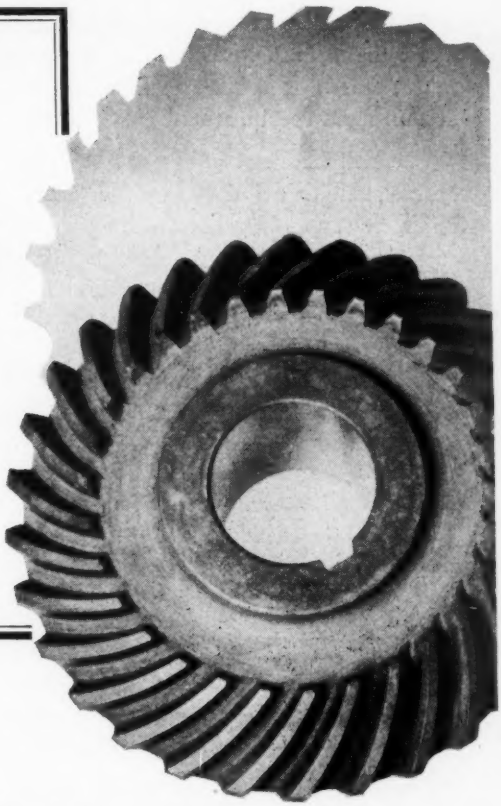
G METHODS

AN A GEAR



costs, reduce rejections, and work with closer precision. Or, if you have a polishing operation that isn't going too well, remember that Lea Technicians are the metal industry's specialists in polishing. Write us in detail about your burring or polishing problem. Send sample of the work, if practicable.

THE LEA MANUFACTURING CO.
Waterbury, Conn.

the Development of Production Methods and Compositions

11-LM-2

Many planes are of wood and fabric construction combined and here again the manufacturer has had to produce a finish that will give good build, will keep the fabric taut, and will yet be light enough to meet certain rigid specifications.

These finishes not only must be resistant to moisture, but must also be resistant to aviation gasoline, oil, hydraulic brake fluids, de-icing fluids, must stand washing with soap and water, and must yet be flexible enough so that when the plane is operating under terrific strains and stresses the finish will not be affected.

In military equipment and clothing there is a certain amount of metal used in the form of clasps, buckles, etc., which again has to be protected by a finish.

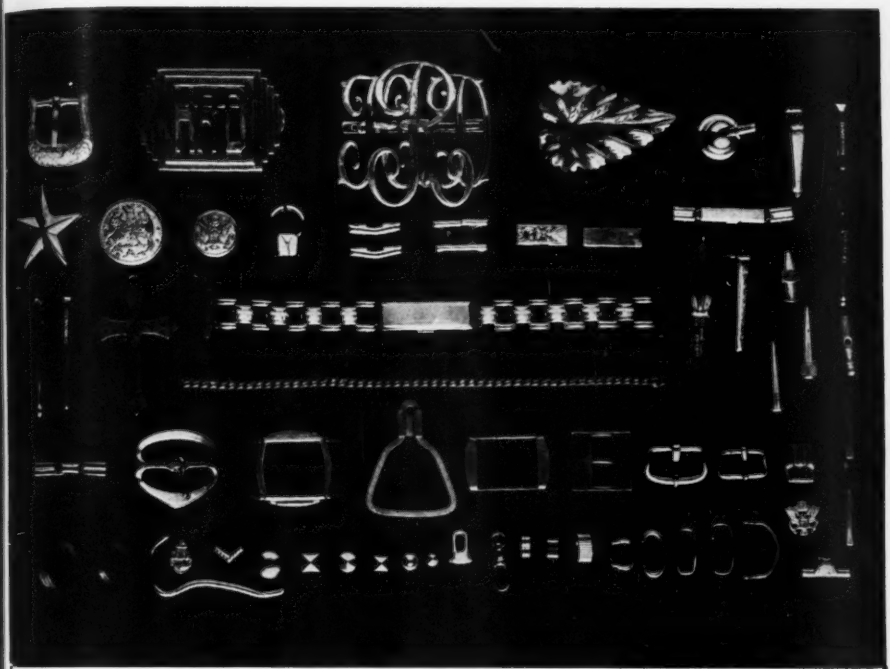
In times of peace, finishes for this type of work for ordinary civilian use have to be good, it is true, but the armed forces require considerably greater resistance due to extreme conditions to which such metal pieces will be subjected.

A finish has been developed in the form of a flat black enamel conforming to Government specifications, and has its application not only on buckles and clasps, but eyelets for shoes and in other similar places.

Another requirement that the finishing industry has been called on to meet is a coating for "throw away gas tanks." These gas tanks are made of compressed fibre or plywood and are used as auxiliary gas tanks, being attached to the plane in such a manner that the extra gas contained therein will give our planes that much more useful range; and once the gas in these tanks has been used up, the tank is dropped from the plane.

A coating for these is naturally essential, and as can be understood, must of course withstand the action of aviation gas as well as being highly moisture resistant and able to be subjected to sharply varying temperatures without failure.

Our company along with many other producers of organic finishes is proud to be able to say that they not only have developed finishes that meet these very rigid specifications in all cases, but have even gone further than is required by the specifications, thus producing finishes that assure extra life, extra strength, and extra power to many items vitally needed in the war effort and which we feel will in no small measure help contribute to final victory.



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SPECTRANOME

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Anodizing Aluminum by the Chromic Acid Process

By L. G. TUBBS
Mutual Chemical Company of America

THERE is practically no aluminum article produced today which is not used in the war effort. Most of these articles are exposed to corrosion against which the natural resistance of aluminum is insufficient. Anodizing is one of the best methods available for the protection of aluminum, and it is a process which the electroplater is especially qualified to perform. Not only does the anodic film possess high corrosion resistance, and is unsurpassed as a base for painting, but it may be dyed to produce attractive colors integral with the film. Increased interest is being shown in the coloring of anodized parts by a simple treatment with water-soluble dyes. The chromic acid process which is generally used in the finishing of aluminum for Army and Navy aircraft, is the only process permitted by the U. S. Navy on structural parts which are constructed so that they might entrap electrolyte. This process consists of the following operations: cleaning, rinsing, anodizing, and a second rinse. For this purpose the work is mounted on racks. After the final rinse the work is dried and painted with a zinc chromate primer, or it may be dyed directly after the final rinse without drying. A slight variation in anodizing procedure is required for some dyed finishes.

RACKING

Racks should be of fairly heavy construction so that the initial surge of current will not cause overheating. The submerged part of a rack should be made of aluminum. Contact points should be firm so as to prevent arcing. Large parts should be provided with more than one contact point and, since anodizing consumes chromic acid and power, it is advantageous to coat the racks except at the contact points. Most "rack-coats" which are used in chromium plating are also satisfactory

for anodizing racks. Each time the racks are used the anodic film should be removed from contact points, either mechanically or by a stripping solution. A hot sodium carbonate solution can be used for this purpose, after which the racks are usually rinsed and given a dip in nitric acid followed by a second water rinse. Parts should be supported with sufficient clearance to permit free circulation of the bath, and they should be sufficiently secure to prevent swinging in the tank. Although the throwing power of chromic acid is excellent, reasonable care should be taken with large sheets to avoid shielding effects. Sometimes auxiliary cathodes are used.

CLEANING

Solutions of the common detergents sold for this purpose are used in steel tanks with heat supplied by steam coils; however, some anodizers prefer an organic solvent particularly if the aluminum has a greasy surface. Satisfactory results may be obtained by either method. Rinse tanks may be made of wood or steel.

ANODIZING

The tank which is made the cathode, is of steel construction, shielded by an insulating material such as wire-glass. Recently plastic sheets also have been used. The bottom of the tank may be covered with loosely-laid acid-proof bricks. Heating and cooling coils are usually on one side, with the temperature controlled automatically. In some installations external heat exchangers are used in place of coils. Gentle agitation is provided by perforated air pipes along the bottom of the tank.

Direct current at 40 volts is supplied by a motor-generator set, or by rectifiers. A common ratio between power and volume of anodic solution is: one ampere to 2 gallons of solution. Estimates of power required to anodize a given area should take into account the initial current surge as well as the average current density for the alloy. This initial surge may be reduced by increasing the time required to raise the voltage to 40 volts. Ordinarily 4 to 7 minutes are required to reach this voltage; however, if this time is increased a larger load of parts can be anodized.

For a new bath a concentration of about 2.5% chromic acid usually is sufficient. As anodizing proceeds, the pH (determined by a glass-

electrode pH meter) increases. When the pH reaches approximately 1.0, chromic acid is added until the pH is reduced to about 0.8 or 0.9; after which anodizing is continued, and additions made in a like manner until the total concentration of chromic acid reaches about 10% (100 grams per liter). The total concentration can be determined by Baumé and pH readings. At pH 1.0 and 12.2° Bé., the total chromic acid concentration is 10%. When the solution tests 12.2° Bé. and pH 1.0, a draw-off of about 120 gallons of solution should be made for each 100-pound lot of chromic acid which is to be added.

By operating the bath in this manner, at a maintained pH and concentration, there is a considerable saving in chromic acid and power, as compared to the old batch process. Another important advantage of the maintained bath is the resulting uniformity of the product.

Some aluminum alloys require special treatment. For example with high silicon alloys, current densities may be very high, but satisfactory results can be obtained with many of these special alloys by anodizing for a shorter period of time, or at a lower voltage.

A Reminder

PERIODIC TREATMENT OF BRIGHT NICKEL PLATING SOLUTIONS WITH NUCHAR ACTIVE CARBON GIVES THESE ADVANTAGES:

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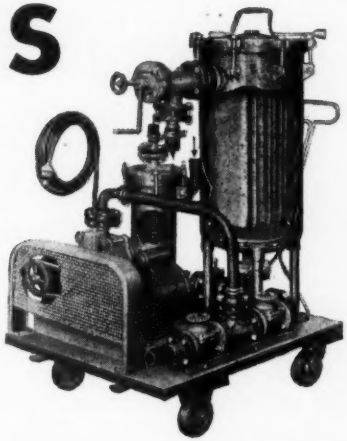

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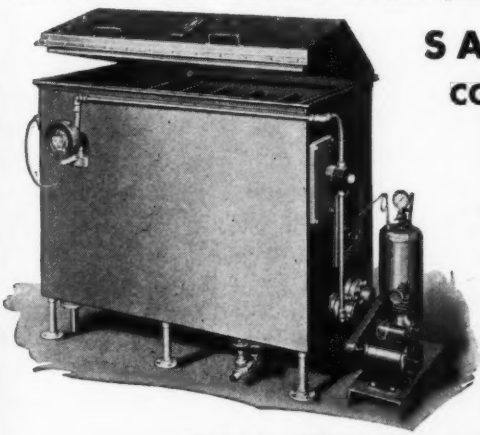

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Buffing and Polishing in War Production

By HENRY R. BENBOW
Vice-President, Divine Brothers Company

THE war program has put a "dim out" on production of the bright, shiny, decorative finishes of a year ago by prohibiting the use of nickel in electroplating and by diverting the metal used in consumer goods to the essential job of providing our armed forces with the material necessary to the speedy winning of the war.

To-day, dull, non-reflecting surfaces are specified on field equipment for obvious reasons. Buffing, however, is still required in the production of search light reflectors, metal mirrors, surgical instruments, transparent plastic hoods, and smooth surfaces on highly stressed metal parts of airplane and diesel engines and other devices.

Flexible wheel polishing with its inherent advantages has enlisted in the all-out war production program for the duration along with machining, grinding, sand blasting, tumbling, and pickling. Although the end use of materials being produced to-day is quite different from that in peace time, these operations still occupy their former places in industry. Just as in other days, the adaptability of flexible wheel polishing finds many applications in the finishing of metal surfaces.

A rough survey of war time polishing reveals that no particularly new operations have been developed to produce war time equipment. Very little fine polishing or grease finishing is being done, but practically all of the regular methods of coarse grain polishing are still being used. The emphasis, however, has shifted so that some of the lesser known polishing operations are now among the more important. This is understandable when one considers the volume of military goods normally produced in peace time as compared to the quantities now being produced. As a result, the main changes which have been made in polishing are

With your new chemical problems

The conversion of a plant to war production usually creates a need for unfamiliar chemicals and unaccustomed processes . . . when you make the changeover you can secure those chemicals from Harshaw . . . even the common garden variety

this is a good thing to know when you have the thousand and one headaches involved in such a change

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The Harshaw Chemical Company
Cleveland and Principal Cities

more in the nature of "stepping up" production rather than radical changes in methods. In other words, just as industry applied production line methods to the polishing of automobile parts, so to-day, production engineers are applying production line methods to the finishing of propeller blades, guns, bayonets, and airplane parts. This means such changes as conversion from hand to machine polishing, more extensive use of formed face polishing wheels, and, in some instances, the use of abrasive belts run over special contact rolls. Set-up bobs of leather, felt, and fabrics are finding wide application in the airplane engine industry. Here they are used for burring and polishing the surfaces of difficult-to-reach spots on the many intricate parts of modern airplane engines.

An army of several million men requires a good many of the articles required in civilian life. This explains why a large proportion of the polishing has not been changed by the conversion to war work. Men in the army have to eat, just as in civilian life. As a result, tableware is still being produced, but the output is consigned to the armed forces. By the same token, quantities of kitchen equipment, carving knives, and meat cleavers are being manufactured. The production of razors, razor blades, and metallic mirrors continues, but has been largely diverted from peace time outlets. The hazards of war activity have required an extensive expansion of the production of hospital and surgical equipment for the care of our fighting men to such an extent that some cutlery plants have taken on this work. Peace time repair and maintenance of automobiles and trucks require considerable quantities of tools and special equipment. Jeeps, armored trucks, tanks, airplanes, and guns are no exceptions; and to-day we find the companies manufacturing such tools and equipment at peak production.

Naturally, the peace time volume of small arms has been enormously increased. The polishing operations have increased accordingly, but the high finish formerly required has been eliminated. Bayonets, too, are no longer highly finished. As an example of this trend, farm implement manufacturers are now finishing bayonets with only slight changes in their polishing procedures. Some cutlery plants have easily converted their polishing operations on knife blades to bayonets simply by eliminating the final grease finishing.

Obviously, data cannot be published on the novel methods in which standard flexible wheel polishing operations have assisted in the elimi-

nation of specific production bottlenecks. It can be said, however, that in most of these novel uses the underlying feature has been the unorthodox consideration of polishing wheels as metal cutting tools rather than tools for the production of decorative finishes. To-day, there are plants without plating rooms which are using set-up flexible polishing wheels to perform metal removing operations. This is fundamentally sound. A set-up polishing wheel is essentially a grinding wheel which can adapt or conform itself to uneven contours. The degree of adaptability can be varied by the selection of materials and type of construction. Densities, or degrees of hardness, can be obtained in a range from the extra softness of a loose cloth wheel to a hardness almost equivalent to that of a solid bonded grinding wheel. Another important feature is the ease of forming the faces of polishing wheels. Several finishing operations can be combined by forming the face of a wheel to the exact profile of a part.

It is interesting to speculate on the growth of this trend toward the use of wheels as machine tools. Very few machinists are familiar with flexible wheel polishing applications, so it does not seem possible that this idea originated in the machine shop. Possibly the elimination of decorative plating and the consequent absorption of platers and polishers into other departments have helped to bring about this application of polishing.

This trend can also be traced to the efforts of polishing and buffing engineers who have been advocating this point of view for many years. Whatever the real cause, or causes, the desired result in speeding up the production of war materials has been achieved.

The polishing and buffing trade is not content, however, to stop there. All of its resources, engineering skill, and ingenuity are constantly at work improving and perfecting methods, materials, equipment, and machinery to keep abreast, and ahead, of our all-out war production effort.

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Zinc and Cadmium Plating

By GUSTAF SODERBERG

The Udylite Corporation, Detroit, Mich.

WHILE the amount of decorative plating done in this country has shrunk to an insignificant figure, the need for protective finishes has increased.

This is particularly true of cadmium plating. In 1941 there was used approximately 8 million pounds of cadmium. Of this amount about 50% was used for electroplating, 32% for steel-back automotive bearings, 12% for pigments and the remainder for alloys, solders and miscellaneous chemicals. Of the 50% used in electroplating nearly one-half went to military applications of one sort or another.

This picture has changed greatly since our entrance into the war. Already during the first 4 months of 1942 over 81% of the cadmium was used for electroplating, bearings taking only about 5% and pigments and chemicals about 9%. Since then, the proportion used for electroplating has increased still further, and practically all of it goes for military uses, directly and indirectly.

Unfortunately, the demand for cadmium now exceeds the production of this material. Cadmium is a by-product of zinc smelting and zinc refining, and a substantial increase cannot be expected.

When civilian production, and especially automotive production ceased, zinc plating suffered a considerable decrease. It is now on the increase again. Part of this increase is caused by substitution of zinc for cadmium. Since much misinformation is being circulated on this score, a short discussion of the situation may be of value.

1. There are a number of applications for which zinc is not suitable.

Since zinc corrosion products interfere with the free movement of moving parts, such parts should preferably be kept in cadmium. Zinc plating followed by chromate treatment may be found suitable in some instances but thorough tests of the individual application appears necessary.

There is considerable danger of zinc corrosion products rotting cloth with which it comes in contact. For this reason articles such as parachute parts of steel should remain in cadmium.

The contact resistance between zinc-plated parts is too high to allow good grounding of gasoline motors for elimination of radio interference.

One factor which is easily overlooked is the greater embrittling tendency of cyanide zinc plating than cadmium plating, and the much greater difficulty in restoring a zinc-plated part to its original condition by low temperature heating. Acid zinc plating, on the other hand is much more satisfactory than cyanide zinc plating, but unfortunately the bath lacks throwing power.

Gray or malleable iron castings are not easily plated in zinc. Some savings in cadmium consumption may be had by coating the part first with cadmium to provide good coverage and then build up the required thickness with zinc. The addition of cadmium to a zinc bath is not recommended since larger amounts of cadmium are required for the same result. Also, much cadmium is lost by sludge formation on the zinc anodes when the bath is idle.

2. A cadmium bath should not be changed into a zinc bath by simply substituting zinc anodes for the cadmium anodes. Cadmium deposits on the zinc anodes as indicated above and much roughness results. The zinc anodes may become practically insulated by the deposition of cadmium sponge. Also, the control of the bath and the deposit becomes unmanageable. Best procedure is to remove the cadmium anodes, make all steel parts in the tank anodic until they are free from cadmium, clean out the tank and start out fresh with a standard zinc solution and zinc anodes.

It should be remembered that for the same minimum plate thickness, zinc plating requires considerably greater ampere capacity of the current producing equipment than cadmium, 50-60% for simple shapes and perhaps 100% for complicated parts.

3. It is interesting to note that while a certain minimum thickness of zinc plate is somewhat superior to a cadmium plate of the same thickness in industrial atmospheres, military authorities generally require a zinc plate which is thicker than cadmium plate when the two coatings can be used interchangeably. The reason is that not only the Navy but also the Army does much of its work on or near salt water. Most of the

material is ocean transported and so far, most of the fighting has been done on beaches and from beach heads. This is another reason why more plating equipment is needed for zinc than for cadmium plating.

4. Accurate chemical control and temperature control is necessary in order to maintain the efficiency and throwing power of a zinc cyanide bath. While cadmium solutions with only occasional attention will operate at 90-95% efficiency, the efficiency of zinc solutions under such conditions may vary all over the map.

The covering power and throwing power of zinc solutions are inferior to those of cadmium solutions. As a consequence many parts with holes must be racked and inside anodes used in zinc plating, while in cadmium plating acceptable results may be had without inside anodes and even by barrel plating. Many examples could be cited were it not for the need of maintaining military secrecy.

It has already been indicated that the application of a chromate film on a zinc surface delays the formation of white corrosion products. There is some increase of the rust protective value also but this increase is probably not of major magnitude.

Considerable care and experience is required for the successful application of chromate coatings. Because such factors as the previous handling of the zinc-plated parts, cleaning, rinsing and drying determine the degree of protection afforded by the chromate coatings, each application requires individual study.

Since the amount of cadmium is much more limited than the amount of zinc available, conservation measures are directed primarily toward saving of the former metal. Part of the reduction in consumption can be accomplished by substituting zinc for cadmium. Perhaps more can be done by decreasing thicknesses specified for such applications which do not require maximum corrosion protection.

Inspectors can do a great deal by using good judgment in not rejecting parts for the presence of stains etc., when the parts meet specifications for thickness and salt spray.

Platers can do much by reducing drag-out losses, by racking so as to reduce local overplating, and by maintaining cleaning and plating solutions in such good condition that rejection for reasons of quality are kept at a minimum.

We Take a Bow

BY E. T. CANDEE
Acting Secretary

WE would like to point out "with pride" or very briefly "crow" about this issue of *The Monthly Review*. The January, 1943 issue of *The Monthly Review* was conceived last October and has been worked on diligently for three months. We hope that the members will find the issue a valuable one and will read it carefully. All authors selected for the various articles are prominent in their field and the information given by them should illustrate that electroplating and other forms of metal finishing is not "on the way out."

To review the work that has been done on *The Monthly Review* in some detail; this issue is not the result of a sudden brilliant idea nor is it a sudden spurt for a single issue after which we will drop back to *The Review* we have known before. Work on improving *The Review* started over a year ago in cooperation with Mr. Kennedy and several changes were made from time to time. This issue is the end result of all that work. The magazine has now been modernized and we hope it meets the approval of the members. It is the earnest desire of the editor, the business manager and the executive committee to always publish a *Review*, which will be of greatest value to the members and at the same time publish a *Review* in which the members can point to with pride. We honestly believe we have accomplished this and hope that the members agree with us.

Suggestions and criticisms are always in order and are welcomed. Any articles which are presented at branch meetings should be sent in to the editor for publication. In these days many speakers are not able to travel from branch to branch as much as they would like to. Because of this *The Review* will be glad to publish these papers so that all members can have the information.

In concluding we would like to repeat our appreciation of the cooperation of Mr. Kennedy when he was active. We also should point out that credit is due Mr. Bain who is responsible for the publishing of *The Review* and the Executive Committee for their cooperation and suggestions.

Salute to Members in Service

EDITOR'S NOTE:

Listed below are men thus far reported by the various secretaries as being in the armed forces. At a recent meeting of the executive board it was voted to suspend dues for the duration for members in the armed forces. Numerous letters have been received in appreciation of this action. The following excerpts taken from a typical letter serve to reflect the appreciation of the members thus affected.

"While home on a week-end liberty I talked to Bill Blankenburg and he informed me that the Society passed a resolution to carry all the servicemen who were members of the Society on the books without dues for the duration. I would like to express my thanks and say that I think that a very good resolution. I had been wondering about my dues etc., so you can see that it was a load off my mind. I have my mother mail my copy of The Monthly Review *so that I can keep up with the rapid changes that have and are taking place in the Electroplating field."*

ANDERSON
R. W. Oyler

BRIDGEPORT
Anthony Turko
David W. Dick

BALTIMORE-WASHINGTON
Roy E. Cole
A. F. Sachs
Albert H. Brookes

BOSTON
Ernest Lawson
Bruce Warner
Frank D'Orio
John Rich
Samuel Milligan
William Meade
Isadore Baker
Edmund J. Quinland

DETROIT
A. J. Richardson
Isadore Roy
Roy Johnson
R. B. Wood
Frederic Wagner

GRAND RAPIDS
John Manning
Jack Morse
F. D. Pace
Keith E. Yhouse
Bernard A. Leemhuis
Lawrence Cornelius

INDIANAPOLIS
Ezra A. Blount
Daniel Wilczniski
David S. Stoker
Charles Walters
Richard G. Wedele

HARTFORD
Edwin Crandall
Clarence Rosenbeck

LANCASTER
Samuel Hilt
Harold Steeb

MILWAUKEE
Robert E. Boettcher
B. T. Calhoun
Ensign Bernard R. Weber
Leonard B. Beck

MONTREAL
Charles Bridges
Fred Clausdale
W. Ramsbottom

NEWARK
Lt. Louis Maine
John Miller
Howard Seivering

NEW HAVEN
Clinton S. Goodwin
Sidney Helliwell
Cortlandt Heyniger
Edward Owsisnik
Lt. Vincent Reade
Paul Zyskowski

NEW YORK
Irving Rosenfeld

PHILADELPHIA
Wm. Moclock

PITTSBURGH
Glenn M. Herring

ROCHESTER
Arthur A. Chambers

TOLEDO
Charles Young

Masters' Electro-plating Association Hold December Meeting

THE rate of operations among the members of the Association for the week ending December 5th was 64% compared with 63½% in November and 80% in December, 1941. Operations seem to be rising slowly but steadily from the low of 56% in August, 1941.

Surveys among the members reveals almost all polishing rooms are working at a very low rate and that plating rooms still have a substantial amount of available capacity in brass, copper, nickel, black nickel, chromium, hard chromium, tin, silver, gold and rhodium. Ball burnishing, coloring, acid dipping, and oxidizing departments are not very busy. Lacquering and enameling are however working at a fair rate.

The Controlled Materials Plan which is being put into operation by the War Production Board will apply only at the present time, to steel, copper and aluminum and their alloys. It may be extended to other materials in the future. Under this plan, seven Government purchasing agencies, such as the Army, Navy, Maritime Commission, etc., will set up production schedules and allot materials to the prime contractors who will in turn re-allot it to their sub-contractors, also setting production schedules for these sub-contractors.

Electroplaters will in almost all cases, be the sub-contractors who will receive their allotments from their customers, the prime contractors.

The first step in obtaining materials will be to state the requirements, that is, to present a bill of materials. The plater will be asked by the prime contractor to state his needs for a job and those needs will be included by the prime contractor in his bill of materials to the Government agency.

Every allotment will bear an Allotment Number and also a Preference Rating. As soon as a prime contractor receives his allotment, he will div-

ide it between himself and his sub-contractors, such as platers.

The plater who receives his Allotment Number from his prime contractor may place his purchase order with any supplier. Normally, he should receive his material during the month designated. In the case of numerous contracts calling for small amounts of material, which often occurs with platers, provision is made for combining any number of such allotments, providing that the plater certifies that he can support the purchase with Allotment Numbers, and furnishes a statement showing how the allotments are divided between the Government agencies. In such combination orders, no one item may include more than 200 lb. of copper.

Inventories of materials under the Controlled Materials Plan will have to be kept.

The Controlled Materials Plan will be partially in effect beginning April 1, 1943. It will be fully in effect July 1st, 1943 for the three metals, steel, copper and aluminum and their alloys.

In the meantime, platers should not submit bills of materials to prime contractors or to the Government agencies *unless specifically requested to do so*, but continue to operate as at present, until the Controlled Materials Plan becomes operative to an extent sufficient to reach the plater.

The War Production Board has revoked Priorities Regulation No. 10 which required that all purchase orders bear designated End Use Symbols. This change applies to all materials bought by platers except copper and copper alloys, such as brass, etc.

ZINC PLATING MALLEABLE IRON CASTINGS

At the meeting of the Masters' Electro-Plating Association held on Wednesday, December 9th, a talk was delivered by Myron B. Diggin, Chief Chemist of the Hanson-Van Winkle-Munning Company, on the subject of Zinc Plating Malleable Iron Castings. An abstract of this talk will be mailed shortly (to Members Only).

EXTRA! means VICTORY

WHEN the newsboy shouts, "Extra!", the man on the street guesses that a victory has been won somewhere. The production executive urges extra effort because he knows it will help to speed the dawn of the great and ultimate victory.

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BRANCH NEWS

Business and Social News · Educational Activities

SPRINGFIELD BRANCH

The regular monthly meeting of the Springfield Branch was held on September 28th at 8:00 P. M. at The Hotel Charles.

The secretary pro-tem reported that a check for $40.11 was being forwarded to The Springfield Branch for their share of the Regional convention held in Springfield last April.

Messrs. Robinson and Logozzo requested that their membership be transferred to the Hartford Branch. The secretary will take care of this matter. Mr. Narcus announced that he is having his membership changed from the Boston to the Springfield Branch.

Mr. Norman Plank, at the resignation of Mr. Logozzo automatically moved in as 1st Vice President. Mr. Irv Niles was unanimously voted in as his successor. Mr. Wayne Saunders of Pittsfield was appointed as his assistant.

A letter from Mr. Candee was read in which it stated that all members of the Branch in the armed services will be able to continue their membership without payment of dues. The secretary will report on the members exempt.

The secretary read a letter reporting that Mr. Candee will assume the duties of the Secretary and National Secretary of the Society.

There was then a discussion from the members who gave their opinion as to what type of subjects they wished discussed at the Meetings. The majority expressed their desire for speakers presenting papers on practical and non-technical subjects.

Mr. Shacat of the United Chrome Co., Waterbury was then introduced. He presented a very interesting paper on Hard Chromium Plating. The talk was followed by a lengthy discussion, and he was given a rising vote of thanks.

The meeting adjourned at 10:15.

The regular monthly meeting of the Springfield Branch American Electroplaters Society was held on October 26th at 8:00 at The Hotel Charles, Springfield, Mass. The meeting was called to order by President Prouty.

Mr. Prouty then introduced Mr. M. B. Diggin, Electroplating Engineer of the Hanson Van Winkle-Munning Co. who gave us an interesting and informative talk entitled "Zinc Plating and its Relation to the War Effort." Mr. Diggin summarized the present status and war applications of the various metals used in the offense efforts, and advised us regarding some of the future applications contemplated with these metals. Following are a few of the "High Lites" of his talk:

Nickel is used largely in the signal and communications equipment branch of the army and navy because of its chemical and physical properties. A new solution is being used in many plants which will employ current densities up to 250 amperes a square foot.

Copper is being used less than formerly but has found a few new uses. Some of which are for protecting steel cartridges during the drawing and annealing operations, and for electroforming rings for large shells. It is still being widely used to protect steel during selective carburizing. New type copper solu-

tions are being extensively used which are a modified copper sulphate and sulphuric acid type using organic addition agents. They may be used at as high as 420 amperes a square foot.

Tin is being used to some extent to protect steel during nitriding, also as a metal lubricant. Its use in solders has decreased considerably in favor of some of the newer and lower tin content and tin-free materials. Its use in the hot tin pot has almost disappeared. Much of the tin used this coming year will be electrodeposited on strip steel.

Lead is coming into the picture more than ever and is being deposited from some of the newer types of baths containing fluorides and fluoroborates. Its use is particularly effective to retard corrosion caused by gasoline of high sulphur content.

Cadmium is being used very extensively particularly in navy requirements, although the navy is now accepting zinc as a substitute because of the limited supply. Between 200,000 and 300,000 more pounds of cadmium have been allocated for 1943 than actually exists.

Silver has been proposed as a substitute for nickel on surgical instruments. It is also being used on bearings. New commercial baths are depositing it at the rate of 70 to 300 amperes a square foot.

Zinc seems to be fairly plentiful, and for this reason is replacing quite a few cadmium solutions. The alkaline cyanide bath is the most popular because of its superior throwing power, brighter appearance, and higher current densities. These differences were further elaborated on.

Mr. Diggins talk was thoroughly enjoyed by all present and he was given a rising vote of thanks. He was kept busy for some time after the meeting answering questions.

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WANTED

Our files at National Headquaters are short on back issues of the Proceedings. In order to complete our record files members who have no further use for their back numbers are urged to send them in. We will appreciate it and so will a number of libraries who need copies.

The meeting was adjourned at 11:00 P. M.

The regular monthly meeting of the Springfield Branch American Electroplaters Society was held on December 28th at the Hotel Charles at 8:00 P. M. The meeting was called to order by President Prouty.

The minutes of the October meeting were read and approved. Since the secretary was absent at the November meeting, President Prouty summarized the events of that meeting.

The secretary read a letter from the hotel management which stated that due to increased operating costs, etc. the meeting room for which we have been paying three dollars a meeting night will cost us $5.00 beginning February 1st.

The secretary then read the names of the following applicants for associate membership:

Daniel Canzino, Pittsfield, Mass.; D. Cesar Roitman, Buenos Aires, Argentina; Frederick G. Webber, Chicopee, Mass., and Donald Isacs, Redfern, Australia, for active membership.

The following persons were granted transfers to the Hartford Branch: Mr. Art Logozzo, and Wm. J. Robinson and Harry Goldberg to the Boston Branch. We received from transfer from the Boston Branch, Mr. Harold Narcus, active member.

Frank Clark, our librarian, introduced Mr. R. P. Crane, Vice President of the Lea Manufacturing Co., Waterbury, Conn., who gave us a very interesting and informative talk entitled "Burring and Its Application to the War Program." In his talk Mr. Crane described the tremendous importance burring plays in the manufacture of airplane engines and other various machines and equipment used in the war program. He described the different methods used to deburr metal parts and also explained the advantages and differences of deburring with greaseless compound.

After the talk was shown an interesting movie on the Grand Rapids Convention.

The talk and the movie were thoroughly enjoyed by all present and Mr. Crane was given a rising vote of thanks. The meeting was adjourned at 10:00 P. M.

D. S. HARTSHORN, JR., *Secretary.*

DETROIT BRANCH

The Sixth Annual Educational Session and Dinner Dance of the Detroit Branch was held at the Statler Hotel, December 5th.

Branch President, J. E. Fritts, opened the meeting and asked the three hundred present to stand to pay their respects to the revered founder of the A. E. S., Charles H. Procter, who recently passed on to his well-earned rest.

Past Supreme President, Wm. M. Phillips, was then introduced and he took over the Chairmanship of the Educational Session.

The first speaker was Mr. T. G. Coyle of United Chromium, Inc. He presented a very informative and comprehensive talk on hard chromium plating. Mr. Coyle emphasized the main features of his discussion with a large display of chromium plated pieces secured from various War Production plants.

Chairman Phillips then introduced our supreme President, Charles Conley, who outlined some of the recent activities of the Executive Board and he advised that an agreeable surprise was in store for us when we received the new Year Book number of the Review. He cited the increase in demand for experienced platers to operate and supervise the metal finishing departments of War plants. In harmony with this trend, the A. E. S. should grow in the direction of the new respon-

THE HOT NOSED REPORTER REVIEWS THE DETROIT ANNUAL MEETING, AS HE SAW IT

HARD chromium by Coyle, hard facts from the Army Air Corps, hard truths from Mr. Moock of Plymouth Motors, and hard chairs from the Statler Hotel featured the afternoon session. Six hundred twenty-eight members and guests sat down at the banquet in the evening; all but six hundred were present when the educational session opened. However, the room rapidly filled up, to the great relief of a nervous committee.

The high C's, without a convoy, were there — Conley, Candee and Caldwell. They were all sober in *the early afternoon.* In fact, they stayed sober throughout the entire proceedings. It is reliably reported that one prominent member of the Detroit Branch ate lunch at the Statler for the sum of 27c, which is miraculous. The ladies were beautiful and no reports of spilled soup were heard. Tuxedos on men were scarce enough that some wearers of same were asked for extra butter.

The party cost in the neighborhood of $3500.00 and advance estimates are that Detroit Branch will wind up somewhere between breaking even and losing about $9278.17. It made no money on the tickets but profited slightly on the envelopes in which they were mailed. Many notable out of town guests were seen by the reporter, including K'burg of Niagara Falls, Hull of Dupont, Cleveland, Anderson of New Jersey Zinc, Southwick of Wyandotte and Saltonstall of Grosse Pointe.

The only discordant note involved the serving of demi-tasse, without any coffee to dunk it in. It was, apart from the above, the usual good, successful Detroit annual meeting. The committee had considered giving cigarette lighters for favors but abandoned the idea inasmuch as gas rationing has cut off the supply of lighter fluid.

E. F. BERRY

sibilities of its members. If the A. E. S. no longer provides facilities for its old members to exchange ideas on electrolytic treatment of aluminum and chemical treatment of magnesium, brass, steel etc., another organization is apt to supply the gathering point for the exchange of this much needed information.

Past Supreme President, Ellsworth Candee, spoke briefly stating that an urgent meeting of the Executive Board in the same city and on the same date as the Detroit Annual Dinner Dance was a pleasant coincidence.

Supreme Vice President, Maurice Caldwell, took a bow and said that he was glad to be with us. That made the feeling mutual, as the Detroit Branch always enjoys a visit with its outstanding former members.

After receiving these pleasant greetings from the supreme officers, Chairman Phillips introduced the second speaker on the program, Lieut. J. Teres, of Wright Field, Dayton, Ohio. He presented a paper chuck full of vital information on many metal finishing operations connected with the construction of military aircraft. Many of the members finishing aircraft parts received some valuable pointers from the Lieutenant's informative paper.

The closing address was given by Mr. H. G. Moock, Vice President of the Plymouth Division of Chrysler Corporation. He gave a very inspiring talk on the everyday problems that confront a War time America. He stated that the old fashioned virtues must be glamorized. Backyards must become vacation lands, and walking a thrilling adventure. We must develop the dashing spirit of the Three Musketeers, whose slogan was "One for all and all for one". We must keep laughing to keep winning. A nation with a sense of humor can't be licked. He illustrated many of his ideas with humorous anecdotes which made their reception pleasant and easy. Needless to say, we were happy to have a man of the caliber of Mr. Moock to close the Educational Session.

Following the Educational Session came the event to which we all look forward. Delicious food, partaken in an atmosphere of music and gay laughter, make Detroit banquets a delightful memory.

Then Doc. Saltonstall, General Chairman, presented us with a superb floor show. The antics of Gus Howard had us continually holding our sides; then we marveled at the amazing Mr. Hall. Of course, we never grow tired of the singing of Sally Johnson and Tommy Evans. Two dancing acts completed the show. Both were well received and thoroughly enjoyed.

After the show Roy Gorrell and his orchestra gave us some of the most delightful music to which we have ever had the pleasure of dancing. Too soon the early morning hours brought to a close another memorable Electroplaters' Party.

WRIGHT W. WILSON, *Acting Sec.-Treas.*

MILWAUKEE BRANCH

The 334th regular meeting of the Milwaukee Branch was held in the Guild Hall of the Republican Hotel, November 6th, 1942. The meeting was brought to order by President Rodney Olsen. Roll call of the officers revealed James Poulson, Second Vice President was absent. The minutes of the previous meeting were read and approved as read.

The Branch voted to allow members who are in the armed forces to continue as members with dues considered paid for the duration. At this time Bernard Weber, Leonard Beck, Bernard Calhoun and R. E. Boettcher are in the services.

Mr. Phil Ritzenthaler reported that he

had chosen Mr. Al Hermansen and Mr. William Geissman as associate members of the committee to represent the Milwaukee Branch on the Milwaukee Associated Defense Committee. He said the Defense Committee had worked on many problems, most of which were of a nature that could not be revealed.

Discussion then turned to the banquet and educational session to be held next April, and Mr. Ray Goodsell suggested that we have a dinner and meeting together. Without anything decided upon, further discussion was postponed until the next meeting.

Mr. Ritzenthaler suggested that we register the guests at our meetings. Due to some fine speakers, we have had a large number of guests.

Then the meeting was turned over to Mr. Omar Doyle who needed little introduction to the Milwaukee Branch since he has been an active member for some time. Mr. Doyle, of Cutler Hammer, Inc., has had considerable experience in plating in barrels to government specifications; and his talk well covered the field of barrel plating. He emphasized the importance of correct loads with regard to square feet and current density. His talk started much discussion on barrel plating. Views were exchanged on the advantages of different types of barrels and baths. Mr. Doyle concluded his speech with charts on screws and bolts, showing how to compute the area of screws by just knowing the length, diameter, and type. These charts appeared in Metal Finishing last year. Mr. Doyle was given hearty applause for his fine talk on a timely subject.

The December meeting of the Milwaukee Branch was held December 4th.

Mr. Ernest Stenberg, former member of the Chicago Branch, has tranfered to the Milwaukee Branch. His address is 2516 N. 51st Street, Milwaukee. We have received the application of Mr. A. H. C. Johnson, 734 E. Beaumount, Milwaukee. Mr. Johnson is a sales engineer with Du Lite Company.

The educational meeting was ably supervised by Mr. William Geissman. The evening was spent in discussing different plating solutions. The members contributed the information and Mr. Geissman organized the talk. The meeting ended with an unusual amount of enthusiastic debate.

JAMES DURNFORD, *Secretary*

BRIDGEPORT BRANCH

The regular monthly meeting of the Bridgeport Branch of the American Electroplaters' Society was held Dec. 4, 1942 at 8:00 P.M. at the Chamber of Commerce Rooms, Stratfield Hotel. 1st Vice President A. R. McNeil opened the meeting with 26 members present.

The roll call of officers was read and a member of the Board of Managers, B. F. Kusterer, and Chairman of the Sick Committee, F. B. Gottharst were reported absent. The minutes of the previous meeting were read and accepted.

C. C. Helmle and A. R. McNeil have reported the purchase of a film projector with a complete demonstration given to them at the time of the purchase. Mr. Ralph Lee of the Electrochemical Chemical Division of the DuPont Co., 350 Fifth Ave., New York City made the film demonstration possible with the loan of the film on "Rayon, Its Manufacture and Use." Many thanks to Mr. Lee from the Bridgeport Branch and the members.

Technical Session Committee reports pictures for our new projector, and Mr. Lester Burton of the General Electric Co., Bridgeport, Conn. as speaker on "Rectifiers," Dec. 18, 1942 at 8: P.M. at the Rose Room of the Stratfield Hotel.

Sick Committee has no report to offer, which shows every member doing fine.

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Membership Committee reports much to be done, but will have a more detailed report at the next meeting.

A letter from Jack Bain of *The Monthly Review* of the American Electroplaters Society, asking for a list of the members of the Bridgeport Branch, with their respective classifications and addresses recorded. The Secretary has complied with this request and the records of the Branch are now in complete agreement with the Supreme Society.

A letter from Acting Secretary, E. T Candee, regarding the amendment to change the name of the Society was thoroughly discussed. After a prolonged discussion, a motion was made and seconded to table the letter until the next meeting.

A letter from the Visiting Nurses Association of Bridgeport, Inc. was received with contents noted. A motion was made and passed to have the Secretary purchase this fine request of a bond for the "Campaign against Tuberculosis."

A letter from the Treasury Dept. enclosing a folder for the purchase of War Bonds. We were and are one of the first Branches to purchase a $500.00 Bond, and our members are individually pledged with this fine and glorious request.

A telegram from E. T. Candee informing the Branch of the demise of our beloved Charles Proctor, founder of the A. E. S. It is hard to believe that men of genius and talent must go the way, as we all must go some day. It is with sadness that the Bridgeport Branch sent a floral offering to the bereaved family of the late Charles Proctor.

Mr. A. J. Carina and Mr. Erlenmeyer to ask their respective Branches for a transfer to the Bridgeport Branch.

The Campaign Inducement was voted and seconded to be suspended, due to giving a tryout of good Technical Sessions as an inducement for prospective members to join our Society.

The Treasurers report was read and accepted.

The Educational Session was turned over to Librarian, C. C. Helmle, with our new film projector in operation. Our Librarian was able to present to the members of the Branch, pictures of the Dayton, Ohio, Boston, Mass., and Grand Rapids, Michigan conventions. The final picture was on "Rayon", with sound effect showing the manufacture and use of rayon. This picture was loaned to us by the DuPont Co. We certainly took great delight in these pictures and really had some fun with them.

The meeting adjourned at 11:15 P.M.

A Technical Session Meeting was held at the Rose Room of the Stratfield Hotel, Dec. 18, 1942 at 8:00 P.M. with Mr. Lester Burton of the General Electric Co., Bridgeport, as speaker on "Copper Oxide Rectifiers". The subject was received with great interest and many thanks to Mr. Burton for his fine talk.

JOSEPH G. STERLING, *Sec. and Treas.*

PITTSBURGH BRANCH

The regular meeting of the Pittsburgh Branch of the American Electroplaters' Society was held 8:30 P.M., Thursday, December 3rd, at the Bureau of Mines.

Mr. Paul Pine, of the Harshaw Chemical Company, gave a talk on "Acid Tin Plating."

Tin plating has been of extreme interest in the Pittsburgh area, with nearly all of the steel companies installing one or more lines for electro-tinning to replace the hot tip process. This has been necessary in order to conserve the very strategic metal. While production practice has been in the range of 100-300 amperes per square foot, laboratories have stepped this range up to 2000-3000 amperes per square foot and eliminated a large part of the brightners and addition agents required at the lower ranges. One of the greatest difficulties of plating at very high current densities is the mechanics of handling the strip at the required high speed.

FRANK R. KELLER, *Sec'y and Treas.*

MONTREAL BRANCH

The regular monthly meeting of the A.E.S. was held Monday, November 2nd, 1942, in the Mount Royal Hotel. Meeting was called to order by Pres. Lunn. Other officers present were 1st Vice President, Jack Reisenberg, and Sec'y-Treas., Eug. Feeley. The minutes of last meeting were read and moved by R. Davidson, seconded by C. Brisebois, carried.

A letter from Mr. Geo. Hogaboom was read regarding his visit to Montreal, and

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the President asked Mr. J. H. Feeley if he would look after this matter. Mr. T. W. Day suggested that Mr. E. C. Rinker of Oakite Products Co. of New York would be willing to offer his services if Mr. Hogaboom was not available.

The application of E. A. Lunn was read, put to a vote and carried.

A letter was read from Mr. Caldwell by our 1st Vice President regarding the membership drive.

There being no further business the meeting was turned over to our Librarian who in turn handed the meeting over to Mr. J. Reisenberg who read a paper on Polishing of Metals, the advantages and disadvantages of using certain ingredients and how they are manufactured. He went into detail explaining the different troubles and headaches encountered in daily practice in the Polishing Room and how to overcome them. He was given a rising vote of thanks for a very educational evening with the President adjourning the meeting at 11 o'clock.

The regular monthly meeting of the A.E.S. was held Monday, December 7, 1942, at the Mount Royal Hotel with President Lunn in the chair. After calling the meeting to order he advised the postponement of the business session to the following monthly meeting owing to the visit of Mr. Rinker to Montreal. He then handed the meeting to our Librarian, E. H. Marsh, who introduced the speaker of the evening.

Mr. Rinker gave Montreal members a real good educational session on Electro Cleaning explaining with the help of movie slides in chart form the advantages of certain chemicals in cleaning compounds, and with our Librarian leading a barrage of questions we received a world of valuable information which is more than welcome to the plater. The President then called on Mr. J. H. Feeley to thank Mr. E. C. Rinker for a pleasant evening.

EUGENE FEELEY, *Sec'y-Treas.*

GRAND RAPIDS BRANCH

The Grand Rapids Branch held its meeting December 11th in the Browning Hotel, the change of place being made because of not being able to have accommodations in the Rowe Hotel. The meetings will be held at the Browning until further notice.

A large number of members and friends attended. A change in conducting the meetings was made. Moving pictures were shown promptly at eight o'clock, and our speaker for the evening, Mr. R. E. Pettit of the Aluminum Company of America, was introduced. He spoke on "Finishes for Aluminum." The technicolor film, "Unfinished Rainbows" was shown in connection. This picture, in sound, told in a romantic manner the story of the modern method of Aluminum manufacture. Also the film "Mine to Metal and Fabricating Processes" was shown. Mr. Pettit had on display a large number of Aluminum samples illustrating the different processes of plating and treating aluminum alloys.

The business was then transacted and reports of committees given. Two new members were elected to membership – Franklin Snyder and James A. Badaluco.

We were then favored by another two-reel picture of "Yanks Invade Africa", showing the latest fighting in Africa by the United States and British armed forces. Another picture was then given, showing how our paratroop men are trained for parachute jumping. Also the picture entitled "East Indian Island" was shown.

The meeting was then adjourned.

C. E. ABEL, *Sec'y-Treas.*

WATERBURY BRANCH

Waterbury Branch held its regular meeting at the Hotel Elton, Friday, December 11, 1942. Dinner was served in the Colonial Room at 6:30.

President Ralph Colter opened the business session at 8:00 P.M. with thirty-nine present. He announced that the Board of Managers had considered favorably the request of Isidore Cross and Maurice Henry for change of status, from associate to active members. After examining the membership record they also decided that George Muscio and Charles Nardozzi were entitled to become active members and therefore their status has also been changed. The election to membership of Charles Healy, Everett Patterson, Domenic Pavone and Joseph Butkus was noted.

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The next business meeting is to be held Friday, December 18th at the home of Wm. D. Starr in Watertown.

W. L. Cassell reporting on membership, reported that our total had increased to 100 members. We have received several new members into the Branch and have dropped three for nonpayment of dues. It is the opinion, that while the growth of our Branch has not been quite as rapid as some, yet the growth is healthy as is shown by the interest displayed.

Ralph Colter urged as many as can to attend the meeting of the Hartford Branch to be held December 14th. Everyone driving should make it a point to fill their cars so none will be disappointed because of lack of transportation.

S. L. Henn read a letter from the National Committee appointed to consider a change of name for the Society. The question of whether the name should be changed so as to include other branches of metal finishing is an important one and should be given thorough consideration by every member. It is hoped that at a meeting in the near future a thorough discussion of the subject will take place.

It was given to Ellsworth Candee, the unhappy duty of announcing the deaths of three men whose interest lay with the American Electroplaters' Society. Kenneth Hawthorne, of Seth Thomas Clock Co., was to have spoken at this meeting on, "Testing of Organic Finishes." It was with regret and deep sorrow that we learned of his sudden death.

One of our own members, Walter Rowe, died on December 23rd, at his home in Meriden. Mr. Rowe was active for many years in the Waterbury Branch and contributed several valuable papers and much practical knowledge to the subject of electroplating. For several years now, he had been confined largely to his home and his presence has been and will be missed by many of us, particularly by our older members who knew him well.

The entire society will mourn the loss of Charles Proctor. It was through his vision and effort that the Organization was conceived and his untiring work has made of it an educational Society that has truly advanced the science of electroplating.

Tennant Elwin, as Technical Chairman, first introduced Bill Starr, who talked on "Priorities." He covered briefly some of the chemicals important to the plater which are easy to get. Chromic acid, made from low grade ore is abundant and no preference rating is required to obtain it. Soap is easy to get, although edible oils are going to lease-lend as are the mineral acids, hydrochloric acid and sulphuric. Zinc sulplate is plentiful, but zinc itself and other zinc products are now more difficult to obtain. Zinc is getting tighter and some people have been advised to substitute lead, which still seems to be plentiful. All in all, the plater must watch his stock of material carefully.

Jacob Hyner, substituting for George Dubpernell, reviewed the book, "Hardness and Hardness Measurements," by S. R. Williams. The theory of hardness of metals is quite complete and various methods for testing hardness are covered in detail.

The moving picture, "Hidden Gold," supplied us by E. I. du Pont de Nemours and Company, depicted the correct and incorrect methods of spraying organic finishes. It showed how by proper handling the loss in enamels could be materially decreased in spraying operation.

Mr. Wm. T. Smith, of Roxalin Flexible Finishes, Inc., spoke on "Tests and Evaluation of Organic Finishes." He told us of the various tests used, both practical and laboratory, to evaluate the worth of various types of organic finishes. Photographs were used to illustrate the results of the tests.

Mr. Smith's talk was accepted with great interest, as it opened up a subject which to many of us was not too familiar, but which should have real practical value for everyone doing finishing of this type. At the close of the talk, Mr. Smith was given a rising vote of thanks.

Meeting adjourned at 10:30 P.M.

S. L. HENN

LANCASTER BRANCH

The Lancaster Branch of the A.E.S. met December 26th at 8 o'clock at Stevens Trade School. There were 21 in attendance.

The Chairman announced the Commit-

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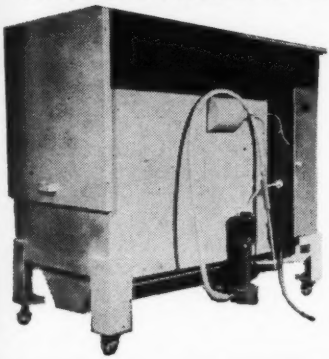

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tee for the Stag Party in February, as follows: Chairman C. Bowers, H. L. Hovis, W. H. Fordney, Clay Brubaker and Chris Brubaker.

The letter from E. T. Candee on the changing of the Society's name was read and it was decided to list it on next month's notice and take action at the January meeting.

The Librarian announced that LeRoy Critchfield of United Chromium would speak on "Lacquers and Resists" at our January meeting. He then introduced Mr. D. B. Diggins of the Hanson-Van Winkle-Munning Company, who talked to us on the "Zinc Plating of Castings." Mr. Diggins talk was very interesting and educational to most all those present, particularly to those engaged in this type of work.

WILLIAM H. FORDNEY,
Secretary-Treasurer

BALTIMORE-WASHINGTON BRANCH

The Baltimore-Washington Branch held a dinner meeting at the Telford Buffeteria on December 5, 1942. Thirty-six guests and members were present. Among the guests were Lieut. K. Pitschner and several members of the Soviet Russian Purchasing Commission. The memory of Mr. Proctor, as founder of the A.E.S. was honored, by a minute of silent prayer and Mr. G. B. Hogaboom delivered a short eulogy. Plans for the Annual Educational Session and Banquet have been completed. The annual meeting will be held at the Lee Sheraton Hotel, 15th and L Streets, N. W., Washington, D. C., on February 6, 1943. The Educational Session begins at 4:30 P.M. and the Banquet at 7:00 P.M.

Seven new members were taken into the Branch and applications for three more were presented.

Dr. V. A. Lamb introduced the speakers on the program:

Dr. Edward Engle and Mr. Charles Cahn of the Colonial Alloys Company, Philadelphia, Pa., who spoke on "ANODIZING AND PLATING OF ALUMINUM"

The lectures were accompanied by interesting demonstrations.

The method of plating aluminum is as follows: Immerse the aluminum in a caustic soda solution, then in a nitric acid solution; now immerse the clean aluminum in a preplate solution which is an alkaline solution containing zinc and a small quantity of copper. The preplate solution produces a thin film of zinc on the aluminum, which can now be plated in a copper cyanide bath. Other metals may be plated over the copper deposit. Other interesting processes which were demonstrated were the use of A. C. current in anodizing and an electrolytic treatment which increases the tensile strength of aluminum by 7 to 10 percent without decreasing its elongation. Also a method of welding two pieces of aluminum by means of a flux was demonstrated.

A. BRENNER, *Sec.-Treas.*

BUFFALO BRANCH

The regular monthly meeting of the Buffalo branch of the Electroplater's Society was called at 8:15 p.m. Friday, November 13, 1942, at Hotel Statler with Joe Ruff in the chair. The minutes of the October meeting were read and approved and the treasurer's report was read and approved.

The meeting was then turned over to Mr. Hamer of the A. E. Hamer Machinery Sales Company of Rochester. He gave a talk on the Phillip's Portable Degreaser Mr. Hamer pointed out the numerous advantages of tetrachlorethylene; the medium with which the Phillips Degreaser is designed to operate. This solvent called Phillsolv is heavier than water and immiscible with it and has a higher boiling point. Therefore, any water which might get into the degreaser, floats to the top and is boiled off. Phillsolv condenses ⅔ more solvent on a given piece of work than other common degreasers insuring more thorough cleaning. No condenser coils are needed, making all the Phillips Degreasers portable. Several questions by the members were answered by Mr. Hamer clearing up some of the points which were not clear. Mr. Hamer was given a rising vote of thanks.

A 1943 convention committee was scheduled for November 19, 1942 at the home of Mr. Fotheringham at 410 Bird Avenue. The meeting was adjourned at 10:30 p.m.

The regular monthly meeting of the Buffalo branch of the Electroplater's Society was called at 8:15 p.m. on Friday, December 11, 1942 at the Hotel Statler with Dr. Wernlund in the chair. The meeting was immediately turned over to Mr. McKeon. Mr. McKeon gave a very interesting talk on the use of Liquid Sulphur for removing electro-deposited copper in thicknesses up to .0005 to .0015. The procedure is as follows: The work is first cleaned in any good cleaner. It is immersed in a 12½% to 20% solution of Liquid Sulphur and water. The reaction may be accelerated by the use of heat. The resulting copper sulfide will be removed with sodium cyanide solution or a strong alkaline solution. This solution does not attack brass, zinc or other base metals. It is sometimes necessary to run through the solution two or more times in order to remove all of the copper. Variations in the procedure such as change of concentration; change of time of immersion, etc., are recommended according to conditions. Advantages of this method of removing copper are that skilled help is not necessary; chromic acid and nitric acid baths are eliminated.

In the discussion that followed, Dr. Wernlund suggested the use of alternating current on the work to speed up the removal of the copper. Mr. McKeon said this had not yet been tried, but that he would try it immediately. When asked about the use of Liquid Sulphur for an oxidizing film, Mr. McKeon suggested one ounce per gallon for copper and ¼ ounce per gallon for silver. Mr. McKeon was given a rising vote of thanks by the members.

The meeting was then turned over to Mr. Logan who took the chair for the business meeting. The minutes of the previous meeting were read and approved and the treasurer's report was read and approved. The motion was made by Mr. Galvin, seconded by Mr. Hart and carried that the January meeting be held on January 15, 1943 in order to accommodate the speaker, Dr. Langnow of the Egyptian Lacquer Company. The motion was made by Mr. Hart, seconded by Dr. Wernlund, and carried that the used playing cards from the General Broc meeting be turned over to the A.W.V.S. The motion was made by Dr. Wernlund, seconded by Mr. Mays, and carried that they hold a dinner meeting on Friday,

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January 8, 1943 at 6:30 in order to make arrangements for the 1943 convention. Mr. Logan appointed Joe Ruff and Don Rice as a committee of two to make arrangements for this dinner. The meeting was adjourned at 9:25 p.m.

J. C. MAYS, *Secretary*

ROCHESTER BRANCH

The meeting of December 18, 1942, was called to order at 8:30 by President John Q. Adams, at the Hotel Seneca. The minutes of the previous meeting were read and approved, and the financial report was also read.

There was no old business to be discussed. Under new business it was voted that all meetings would be held at the Hotel Seneca for the duration.

Mr. LoPresti, Educational Chairman, conducted a question and answer period among the members. Wartime finishes and priorities were discussed.

The meeting was adjourned at 10:30.

DONALD BLUM, *Sec.-Treas.*

BOSTON BRANCH

The Boston Branch met Thursday, December 3. at the Statler Hotel, with President Swift in the chair.

Minutes of the previous meeting were read and approved; bills read and ordered paid.

Communications read included one from the Committee on the question of changing the name of the A.E.S. Both the letter and amendment were discussed and a Committee of three appointed to study this and report to the next meeting. Arthur Mintie is Chairman of the Committee and other members are Louis Gagnon and Robert Smith.

The application of Charles R. Culgin, 673 Washington Elms, Cambridge, Mass., was read for the first time and turned over to the Board of Managers for approval.

Three applications approved by the Board of Managers were elected to membership as follows: William E. Dailey, 72 Sycamore Ave., Brockton, Mass., Active; Howard R. Range, 17 Hartwell Street, Waltham, Mass., Active; and James J. Grossbard, 23 Claflin Road, Brookline, Mass., Active.

The speaker for this meeting was our President George P. Swift. His subject was taken from the 1942 Convention, "Iron Plating and Its Applications" by V. A. Lamb and Dr. Blum.

Mr. Swift read it through explaining each point as he went along which made it very interesting. He answered all the questions for the members and was given a rising vote of thanks.

It was suggested that the Branch read these talks at the meetings in the future.

We also had as a speaker at this meeting Derrick S. Hartshorn of the Enthone Company of New Haven, Conn. He spoke on "Black Finishers on Iron and Steel". He explained how to use the Ebonol on different finishers. It was interesting and a vote of thanks was given for his very fine talk.

Meeting adjourned at 10:30 P.M.

A. W. GARRETT, *Secretary-Treasurer*

CHICAGO BRANCH

The regular monthly meeting of Chicago branch was held Friday, December 11, 1942, at the Atlantic Hotel.

President F. K. Savage presiding and all other officers present.

The telegram received from Mr. Candee telling of the death of Mr. C. Proctor, founder of the A.E.S., read with deep regret and Chicago branch extends their deepest sympathy to the family of Mr. Proctor.

Mr. Smallman, Chairman of the Banquet Committee, reported that all plans were now complete for our Annual Educational Session and Banquet to be held January 23, 1943, at the Palmer House. We will have a very fine educational session, and Mr. Mattacotti urges all members to attend.

Mr. Mattacotti, the Librarian, introduced the speaker of the evening, Mr. M. Schneider of the Standard Rack Company, who made a very interesting talk on the "Flexibility of Standard Plating Racks." The long discussion that followed Mr. Schneider's talk proved that a great amount of interest was shown in the subject of plating racks.

The sound motion picture "Lubrication" was very interesting and instructive.

There were 75 in attendance and the meeting adjourned at 10:30 P.M.

J. W. HANLON, *Secretary*

NEW HAVEN BRANCH

New Haven Branch held its regular monthly meeting on November 3, 1942 in the Sterling Chemistry Laboratory of

Yale University. This was the second in the series of combined business and education sessions being conducted by the branch.

In the absence of President Clarence Garner and V.P. Ed Luther the business session was conducted by Secretary Walter Lynch. The minutes of the previous meeting were read by Assistant Secretary Kay Jaros and accepted by the members present. The chief business conducted at this session was a discussion of the proposal regarding a change of the meeting place of the branch. The motion was offered in the hope that the choosing of a more central place would offer the members a better opportunity to attend the meetings. At this new meeting place some form of refreshments could be served after the meeting and allow the members to become more closely associated. Mr. Joseph Downes led the opposition to the motion and pleaded successfully for deferment of a vote on this motion until everyone present thoroughly thought over the matter. After this discussion the business meeting was considered closed and the presiding officer turned the meeting over to the educational chairman for the evening, Mr. Joseph Downes.

The speaker for the educational session was Mr. Dick Crane, Vice President of Lea Manufacturing Co. and a prominent member of the Waterbury branch of the A.E.S. Mr. Crane is also well known in the national society and an authority on the subject he spoke on, namely, "Burring and Its Importance to War Production." The company which Mr. Crane represents has been the foremost leader in the mechanical methods to eliminate burrs and the speaker has covered the entire country in his efforts to speed up our country's war production by introducing the methods devised by Lea.

In the manufacture of the precise instruments necessary for the success of our country's war effort burring became a problem because most government specs call for the complete removal of all burrs. The two general methods of removing burrs are by mechanical means and by hand operation. In the early stages of war production and even at present in some factories, filing and emery cloth sanding had become "the

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national indoor sport." When production was increased then manufacturers turned to barrel finishing which proved to be an aid to production, but the precision required was not arrived at. Various mechanical methods were resorted to in the form of (1) Wire wheels (2) Tampico wheels (3) Mounting abrasive points in some adhesive (4) Rotary files (5) Polishing wheels (6) Sanding belts etc., to increase production but yet retain precision. Finally, the Lea Co. introduced the use of flexible tools and grinders.

These tools used the principle of flexible head abrasion with high speeds of 3,000 to 100,000 r.p.m. The heads on the wheels were made of felt bobs using some abrasive impregnated in the wheel. This type of wheel allows high speeds but yet not too much rigidity, this flexibility is necessary in work where tolerances are very close. In all of this work it is important to consider the stock being finished, a hard material leaves burrs which can be snapped off while soft material leaves burrs which flatten out rather than snap off.

After the talk Mr. Crane answered numerous questions asked by the audience and showed many specific instances where modern burring methods have served to increase our country's production of tanks, planes, guns, and numerous parts used in our war effort. There was little doubt that the members present found much to profit by their attendance at this meeting, and the fact that election night kept the attendance down served to allow many members to miss a very educational session. The meeting closed at approximately 10:30 o'clock after a rising vote of thanks was extended to Mr. Crane for his fine speech.

WALTER LYNCH, *Secretary*

CLEVELAND BRANCH

Minutes of the meeting of the Cleveland Branch of the American Electroplater's Society held December 4, 1942, in the Cleveland Hotel.

The meeting was called to order at 8:30 P.M. by our President, Mr. William E. Oberg.

The minutes of the previous meeting were read and approved as was also the Treasurer's reports of November 4th, 1942 and December 2, 1942.

The following applications for membership were read and referred to the Board of Managers:

William Edwards of Cleveland, Ohio, as Associate

Tully S. Hammer of Cleveland, Ohio, as Active

Arlond E. Larson of South Euclid, Ohio, as Associate

Henry J. Schmidt of Cleveland, Ohio, as Active

Arthur A. Schueneman of Cleveland, Ohio, as Associate

The following candidates having been approved by the Board of Managers and their names published in *The Monthly Review* were eligible for election:

Robert W. Renton of Euclid, Ohio, as Associate

Sylvester G. Domen of Mobile, Alabama, as Active

Upon a motion made by Mr. J. Honnecker, seconded by Mr. C. Carrick, it was decided to elect the two candidates by popular acclaim collectively rather than individually. Motion carried and the two were elected to membership.

A letter dated November 6, 1942, received from a committee composed of Messrs. E. T. Candee, G. W. Wagner and C. C. Helmle, all officers in the National Society, was read. This letter pertains to a contemplated change in the name of the Society and asks for a consensus of opinion. In view of the seriousness of this question the chair appointed a committee consisting of Messrs. J. Honnecker, J. Singler and William Scott to look further into the matter and to submit their findings in writing.

A telegram was read from our National Secretary, Mr. E. T. Candee, advising us of the death and funeral of the founder of the American Electroplating Society, Mr. Charles Proctor.

The meeting was then turned over to our Librarian, Mr. J. Honnecker who introduced the speaker of the evening, Mr. G. Soderberg, of the Udylite Corp. of Detroit. Mr. Soderberg gave a very interesting talk on the use of inside anodes in cyanide zinc baths. This was enjoyed by all and after a rising vote of thanks the meeting adjourned at 10:30 P.M.

GEORGE B. SVENSON, *Secretary*

LOS ANGELES BRANCH

The regular monthly meeting of the Los Angeles Branch was held at the

Rosslyn Hotel Nov. 11.

Owing to the illness of the Secretary, Mr. Ervin Frauenhoff, the past Secretary took notes. Mr. M. D. Rynkofs gave the minutes by phone from his sick bed.

President E. R. Holman opened the meeting and asked the Sergeant at Arms to introduce the visitors, Mr. Acker of Fuller Paint Co.; Mr. Butler of Pomona Plating; Mr. Ahumada of Cadmium Nickel; Mr. Coyle of United Chrome; Mr. Houston of Menasco Chemical; and Mr. Fred Maurer, a visiting member who is serving with the armed forces. Mr. Maurer is working under Plant Protection and pointed out some of the most important things. 1. Cleanliness and orderliness. 2. Fire protection. 3. Sabotage prevention. 4. Identification. Mr. Maurer has the rating of First Lieutenant.

Mr. E. Lamoureux is to call a meeting of the Board of Managers.

Mr. M. D. Rynkofs was appointed chairman of the annual dinner dance. He asked the ones present to present their views on the possibility of holding such an affair at this time. Comments were favorable.

The meeting was turned over to the Librarian, Mr. ApRoberts, who introduced the speaker of the evening, Mr. Acker of Fuller Paint Co. Some of the points brought out in Mr. Acker's talk on plating and painting were, acid condition necessary for paint adhesion, zinc dichromate acts as inhibiter, possibility of baked organic coating in place of plating, and more that I cannot make out from brief notes.

Mr. ApRoberts thanked Mr. Acker for his excellent talk. He also announced that for our next meeting we are to have Mr. W. Paul Sykes, foreman of processing department, Vega Aircraft Corp., who will speak on racks and racking methods for anodizing aluminum. Mr. James Houston, foreman plater for Manasco Aircraft Co., who will speak on or give a brief demonstration of methods for packing small washers, nuts, bolts and similar parts. Looks like aircraft night.

Meeting adjourned.

C. C. MCLAREN, *Secretary*

NEWARK BRANCH

The regular meeting of the Newark Branch A.E.S. was held on Friday evening, November 6th, 1942, at the Hotel

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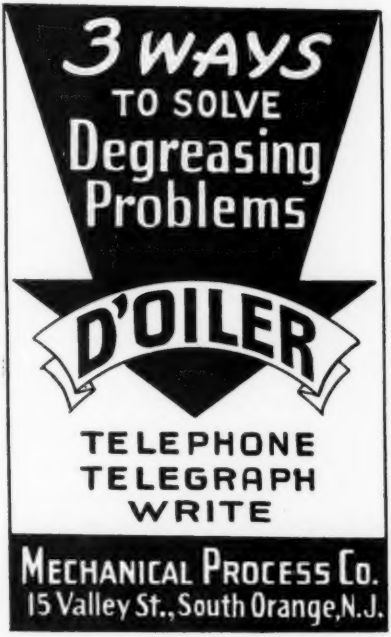

Robert Treat, Newark, New Jersey. The meeting was called to order at 8:30 P.M. with President William Bruhns presiding. All other officers were present.

The minutes of the previous meeting were read and approved.

A communication from R. Rabourden was read and placed on file. A communication from Maurice Caldwell, with reference to enlarging the membership, was read by our 1st Vice President, Robert R. Sizelove.

Application for Herbert R. Millwater to Associate Membership was voted to take the regular course.

Mr. Horace H. Smith, Chairman of the Christmas Party Committee, reported that the Committee had held a meeting and that the admission to members and their wives would be $1.50 per person and to outsiders $2.50. Horace, George Klink and George Wagner next reported on their trip to Canada where they had attended the Toronto-Rochester-Buffalo Branches' Educational Session and Banquet. Our President, William Bruhns, next brought up the subject of a new course to be instituted at the Essex County Vocational School. After considerable discussion, it was decided to have our Educational Committee meet with Dr. Ernst of the Essex County Vocational System for final arrangements to settle this controversy.

Our Librarian, Mr. Maguire, next introduced the guest speaker of the evening, our own fellow member, Zachary Irenas. who gave a very interesting paper on "Cadmium Plating." Zachary was kept on his feet for at least a half hour after the completion of his paper to answer questions which were coming at him from all directions. A motion was made and carried that this paper be forwarded to the *Monthly Review* immediately for publication. The speaker was given a rising vote of thanks by the 52 members who attended.

The meeting was adjourned at 11:00 P.M.

GEORGE WAGNER, *Secretary*

PHILADELPHIA BRANCH

The Philadelphia Branch held its regular monthly meeting on December 11th, 1942 at 8:00 P.M. at the Harrison Laboratory, University of Pennsylvania, Pres. Nat. Venelle opened the meeting, with 42 members present.

The roll call of officers was read and all were present with the exception of Al Hirsh, of the Board of Managers.

The minutes of the previous meeting were accepted as read. I. W. Marcovitch was elected to Associate Membership. The transfer of Mr. V. Julianne, of the New Haven Branch, was accepted.

Communication from E. T. Candee on the amendment to change the name of the society in 1943 convention, was read and tabled for future reference.

Communication from Jack Bain received with regard to new cut on letterheads.

Secretary's mailing expenses were ordered paid.

George Gehling brought up the matter of having a tri-state banquet of New York, Newark and Philadelphia Branch together.

Motion was made and seconded to have the entertainment committee investigate all angles and make a report thereon.

It was with deep regret and sympathy for his family that we noted the death of our founder, Charles Proctor.

The speaker of the evening was our own amiable Secretary, Paul Mentzer, who spoke on "Hard Chrome Plating." His interesting and informative lecture with his personal experiences was enthusiastically received by all members present.

After Mr. Mentzer's lecture an interesting question and answer period on Hard Chrome Plating was held. which proved that Messrs. Lyons and Mazia also have had considerable experience with hard chrome. With a round of applause for Mr. Mentzer the meeting adjourned at 10:30 P.M., next meeting date January 22, 1943.

HENRY G. ORLIK, *Secretary Pro-Tem*

BRIDGEPORT BRANCH

The December meeting of the American Electroplaters Society was held at the New Britain Trade School, New Britain, Conn., on December 14, 1942. One new member was elected. Mr. I. Laird Newell of the Henry Souther Engineering Company in Hartford.

A talk, titled, "How to Get What You Expect from Power Washing Now and After the War" was presented by Kenneth P. Bellinger. Several door prizes,

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presented by local suppliers, were distributed to the members and guests.

K. P. BELLINGER, *Secretary*

TORONTO BRANCH

The regular meeting, held in the Royal York Hotel, December 11, was the last meeting for 1942. President Boaz in the Chair opened the meeting with 47 members present – the largest membership for this year. Walter Barrows was there, too, and the boys were glad to see him. Letters were read from Mr. Candee and the Lea Manufacturing Company. The convention proceedings had just arrived and were given out to the members.

We were sorry to hear of the death of our founder, Mr. Charles Proctor.

Three applications were balloted on and elected into membership as follows: Mr. Henry Sutton, Mr. George McFarland, Mr. Albert Clarke.

All arrangements were made for a dance on February 12, 1943, under the able management of Messrs. Boaz, Byers, and Fitzsimmons. Also the holding of the annual Banquet and card party to be held March 19th under the guidance of the old Committee, Messrs. O'Keefe, Graham, and Kemish.

President Boaz then called on Mr. Arthur West, Mr. C. Kemish, and Mr. Percy Cockfield as speakers of the evening.

Mr. West took as his subject, "Rinsing and Dipping" stating that today we plated faster because of hi-speed solutions, but it is a mistake to dip and rinse at the same speed. The most essential thing outside of the plating solutions is clean water. He emphasized the use of the double rinse tank, stating we have different cleaners for the different metals and use them accordingly, but when it comes to rinse water, many a job is spoiled through contamination. He also mentioned spray rinse and the dam overflow as ideal conditions and stated that no article should be rinsed less than 3 seconds.

Mr. John Acheson then took the floor and explained in detail the functioning of the dam overflow, giving pipe measurements, etc.

Next was Mr. Cockfield, whose subject was "Accident Prevention." He spoke on punch press work, drilling operations, why guards had to be used, and why women had to wear caps and hair nets. He explained how accidents could happen within a split second. Mr. Cockfield gave out data listed under "Compensation for 1939 in the Province of Ontario." Altogether it was a very interesting talk.

Mr. Kemish was next with "Plating Rack Insulation." He showed us some of his racks and explained how it was done by the use of the spray and the dip method. With one of his many racks he tried to beat the relic belonging to John Acheson but couldn't do it. This one was like a rough plaster cast – extraordinarily rough.

A hearty vote of thanks was given the four speakers terminating a very pleasant evening. The meeting was adjourned at 10:45.

JAMES S. CAIRNS, *Secretary*

LOS ANGELES BRANCH

The last regular meeting for 1942 was held on Wednesday, Dec. 9th at the Rosslyn Hotel with an almost record-breaking attendance. There were 52 present.

The meeting was called to order by President E. R. Holman.

Minutes and financial reports were read and approved.

The bills were read and ordered paid.

The death of Mr. Proctor was announced and Mr. E. Lamoureux was asked to say a few words for the benefit of the younger members. He stated that Mr. Proctor was the Founder of the A.E.S. and his foresight of the importance of platers exchanging ideas on plating problems has advanced the plating industry where it is today. The A.E.S. Branches throughout the country will speak for his efforts.

Mr. Stanley Rynkoffs was asked to introduce the visitors who were, Paul Sykes, Vega Aircraft; Paul Trout, Vultee Aircraft; Bob Cartwright; L. M. Wolf, Chrysler Motors; M. L. Rimmen, Turco Products Co.; Warren Keseling, Turco Products Co.; Dan Buist; Al Simpco; Frank Dingwall, Chrysler Motors; J. H. Abbott, Utility Fan Co.; Donald Orr, Cadmium Nickel; Jack Wiseman, Grand Rapids, Mich.; Jim Bergman, General Chemical; Jack Damon, General Chemical; Lawrence

Veling, Veling Plating Co.; Lincoln Van Camp, Menasco Mfg. Co.; Mitchell Raskin, Northrop Aircraft; D. D. Williams, Northrop Aircraft.

Mr. Marcus Rynkoffs reported on the educational meeting and dinner dance that will be held in March at the Elks Club. He announced that there will be several very good speakers who have agreed to appear at that time.

Mr. ApRoberts read a letter from Mr. George B. Hogaboom stating that due to the uncertainty of his work at the present time he would be unable to say if it were possible for him to attend our annual affair until a very short time before it is to be held.

The members were informed of the death of one of the oldest members, Mr. W. E. Hurd who passed away on Nov. 29. We all feel that we have lost a very good member.

We were informed that owing to the fact that the government has taken over the Rosslyn Hotel we will have to find another meeting place and it was agreed we would hold our meetings at the Elks Club at 607 S. Parkview, Los Angeles, close to West Lake Park. Date to be announced later.

The meeting was turned over to the Librarian, Mr. ApRoberts, who introduced the speaker of the evening Mr. Paul Sykes of Vega Aircraft. Mr. Sykes' topic was, "Methods of Racking Aluminum Parts for Anodizing," which was illustrated with special production drawings. He also gave some very interesting points on heat treating aluminum, pointing out the importance of the proper way to hang the piece to be heat treated so as to cool evenly and at once so as not to cause warpage, also with illustrated drawings on blackboard how he had overcome several racking problems in anodizing different shapes and lengths of pieces.

What kind of containers are used to anodizing rivets?

Ans. Boeing Aircraft has patent on the answer. It is a square basket with a pipe with holes running along the sides that connect to a pump that forces the solution through the work.

The Librarian thanked Mr. Sykes for his talk.

Meeting adourned 10:45 P.M.

C. C. MCLAREN, *Secretary*

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BOOK DEPARTMENT

BOOK REVIEWS

By

GEORGE DUBPERNELL, *United Chromium, Inc.*

Hardness and Hardness Measurements. SAMUEL R. WILLIAMS. 558 pages. American Society for Metals, Cleveland, Ohio, 1942. Price $7.50. This is the first comprehensive and well rounded reference book on hardness testing which has come to our attention. The history of the subject is well treated and the book is profusely illustrated. The theory and practice of present day methods of hardness measurement are well presented. Methods used for hardness tests on very diverse materials are described, as for example on rubber, wood, wax, metals, minerals, glass, etc. No specific discussion of the hardness of electrodeposits is given. The book is provided with a combined subject and author index which does not include the authors in the bibliography. The bibliography is a very extensive separate section covering pages 463-546. The references are given very completely; arranged in twenty-two subject groupings in alphabetical order according to the name of the author under each subject.

★ ★ ★

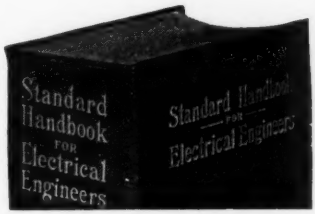
An Introduction to Electrochemistry. SAMUEL GLASSTONE. 557 pages. D. VanNostrand Company, Inc., 250 Fourth Avenue, New York City, May 1942, Price $5.00. This is a beginning college textbook on the theory of electrochemistry, without much reference to industrial applications. Excellent illustrative problems are given at the end of each chapter, but without answers or direct helps to their solution which might adapt them to home study. The series of articles which Professor Glasstone is writing for *The Monthly Review* is better adapted to the needs of platers.

The present book is of course new and up-to-date, but is less comprehensive and gives less detail than the author's "Electrochemistry of Solutions," which is more of a reference book and appeared in its 2nd edition in 1937. Not much space is given to the electrodeposition of metals and directly connected subjects. Analytical applications of electrochemistry appear to be well treated. The chapter headings are: Introduction, Electrolytic Conductance, The Theory of Electrolytic Conductance, The Migration of Ions, Free Energy and Activity, Reversible Cells, Electrode Potentials, Oxidation-Reduction Systems, Acids and Bases, The Determination of Hydrogen Ions, Neutralization and Hydrolysis, Amphoteric Electrolytes, Polarization and Overvoltage. The Deposition and Corrosion of Metals, Electrolytic Oxidation and Reduction, Electrokinetic Phenomena.

★ ★ ★

Cleaning and Finishing Metal Products. Published by The Iron Age, New York. Cloth, 240 pages, 7x10, price $3.00. This book is made up of reprints of articles which have appeared in The Iron Age on metal cleaning and finishing. In addition contains considerable information on latest plating developments. A rather unusual opportunity to obtain this book since the sale has been highly restricted.

Standard Handbook for Electrical Engineers, New 7th Edition. Each section treated by an expert. Published by McGraw-Hill, New York, 6x9, 600 tables, 1700 illustrations, 2,303 pages, 2,160,000 words, $8.00. New format, larger page, larger type, larger diagram. Designed to users specifications. The average engineering treatise contains 500 pages and about 190,000 words. At this rate the Standard Handbook is the equivalent of 12 of these books.



★ ★ ★

Modern Metallurgy for Engineers. Frank T. Sisco, 6x9, 432 pages, cloth bound, price $4.50. Published by Pitman Publishing Corp., N. Y. From his intensive research, wide practice of metallurgy and experience in teaching metallurgy and metal testing to officers of the U. S. Army Air Corps, the author provides essential data on the engineering properties of metallic materials, the variables affecting these properties and their significance to engineers. He shows briefly the relation between constitution and structure of materials and properties in an elementary discussion of fundamental modern concepts of physical metallurgy. Questions on each chapter are provided.

★ ★ ★

With this issue of *The Review* we inaugurate a new reader service, the A.E.S. BOOK DEPARTMENT. This new feature will become a regular department from this time forward. Mr. George Dubpernell of United Chromium, Inc., will review two or more books each month, and in addition others will be listed. Members will thus be informed of new books which will help solve daily problems. You are urged to take advantage of this offer and order books of interest through your own A.E.S. book department at National Headquarters, New York.

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THE QUESTION BOX

PHILADELPHIA BRANCH

What is a good formula for hard chrome solution?

Ans. General opinion is the 33 oz. per gal. solution, 90-100 to 1 ration So x. As proven by the Bureau of Standards also lower drag out loss.

How thick has hard chrome been plated?

Ans. At least to .025 in. to knowledge of author.

How thick should a hard chrome plate be before it can be measured for Brinell hardness? What method is used to test and what hardnesses are possible?

Ans. The thickness is not an important factor. Chrome plate usually cracks on Rockwell or Brinell test, the Vichers machine is most reliable. Hardnesses of 50 to 68 C Rockwell possible.

Are any other methods than sulphate chrome commercially successful?

Ans. H 2 S F6 used to some extent in decorative chrome. No advantage over sulphate, rather a disadvantage, causing a formation of a silicaceous coating over anodes which decreases anode efficiency.

What is fastest known rate of deposition of hard chrome?

Ans. Commercially possible to plate 5,000 A.S.F. if generator capacity available.

Can chrome plate be made to hold lubricants?

Ans. A patented method using reverse current in plating both after final thickness has been obtained, causing an itch which holds lubricants, is on the market.

What is the erosion effect of hot glass working on chrome plated stainless steel?

Ans. Chrome plate holds up very much longer than stainless itself in case of pressure moulding to close tolerances. Cast steel is a satisfactory base metal of mould if tolerances are not close.

Does the hardness of base metal effect hardness of chrome?

Ans. No.

How would you plate 1020 in. hard chrome on drawing die made of half hardened steel and carbalory?

Ans. Carbalory (tungsten carbide) is attached in chromic acid. Part of die made of steel and flash plate exposed carbalory at high C.D. Remove stop-off and plate entire die.

What makes hard chrome hard?

Ans. Chromium is hard itself in natural state. Hardness increases over this in plating process, same is true with nickel or most any other metal plated.

Is it possible to obtain good results on punching dies? Will the edges chip?

Ans. Good results obtained. Edges will not chip if well protected by dummies (rubbers) to prevent excessive C.D. on these edges.

HENRY G. ORLIK, *Librarian*

CHICAGO BRANCH

How long will it take to plate silver to .003 and at what current density to obtain a smooth deposit?

Ans. Some silver is being plated at high amperage but 10 amp. per sq. ft. is practical commercial limits under normal conditions and it will take about ¾ hr.

Is there a patent on the use of Bi-polarity anodes? If so, who owns it?

Ans. Yes, a German patent, by Ernst Wurth.

How do you remove carbon smut from steel; also does an inhibitor in the pickle reduce the amount of smut?

Ans. One member stated that he uses 1 oz. of cyanide per gal. to remove smut from steel; also the use of an inhibitor in the pickle does reduce the amount of smut.

How can silver be stripped from Brass, Bronze, and Bergl copper?

Ans. 6 oz. sod. cyanide to the gal. with reverse current will strip silver from brass and bronze. On the bergl copper, use hot con. sulphuric acid with 2 oz. per gal. salt peter no current and be careful to keep water out of this bath.

J. W. HANLON, *Secretary*

LOS ANGELES BRANCH

What is the best formula for zinc?

Ans. Guide Book for 1942.

Which has the best cross resistance, regular or bright zinc?

Ans. Bright zinc has a light edge, owing to the structure of the metal.

What methods are used to make scribing lines stand out?

Ans. Green templet paint.

C. C. MCLAREN, *Secretary*

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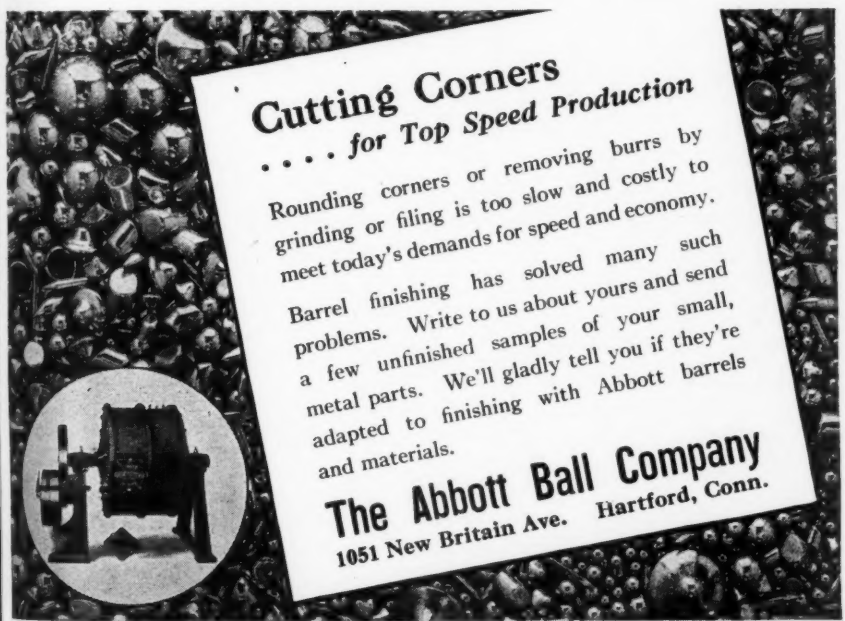
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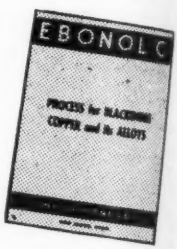

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BALTIMORE-WASHINGTON BRANCH TO HOLD ANNUAL MEETING FEBRUARY 6, 1943

The Baltimore-Washington Branch will hold their Annual meeting at the Lee-Sheraton Hotel, 15th and L Streets, N. W., Washington, D. C., on Saturday, February 6, 1943. The Educational Session will begin at 4:30 P.M. Papers will be presented by the following:

Mr. Richard A. Dimon, Research Chemist, Carnegie-Illinois Steel Corporation, "The Electrolytic Tinning of Strip Steel".
Mr. Frank K. Savage, General Superintendent, C. G. Conn., Ltd. Subject to be announced.
Mr. Gustaf Soderberg, Udylite Corporation. Subject to be announced.

The Banquet will begin at 7:00 P.M. and will be followed by entertainment and dancing. The price of tickets is $2.50 each. The low price of the ticket is made possible because the cost of the entertainment and of the educational session are being born by the Branch treasury. Tickets may be obtained from Abner Brenner, 6509 Fulton Street, Chevy Chase, Maryland.

IMPOSTOR *fleecing members*

Members and readers are warned to be on the alert for an impostor who has been obtaining funds from members under false pretenses.

Method of operation is to pose as brother of a member or close friend of a distant representative. The impostor uses the story of having lost his wallet and needs funds to catch a certain train for home.

Apparently this man knows the Society and industry well and makes a very plausible story by glib reference to prominent members, meetings and the like.

Description: Man is about 50 years of age, approximately six feet tall and quite thin. Wears a toupee of reddish brown, parted on the side. Wears horn-rimmed glasses. Complexion is ruddy and he is smooth shaven. General appearance is somewhat unkempt. Has a smooth, soft voice and speaks with fair rapidity although not a fast talker.

When last seen was wearing a salt and pepper suit and gray overcoat.

All persons are urged to be on guard for this impostor who should be reported to police if located.

MEMBERSHIP REPORT

MAURICE R. CALDWELL

Chairman, Membership Committee

To January, 1943

ELECTIONS

Baltimore-Washington Branch

David Davis, 706 Ingraham St., N.W., Washington, D. C., Associate

Lawrence J. Eckenrode, 2241 30th St., S.E., Washington, D. C., Active

Samuel S. Eldredge, 630 North Johnson, Pocatello, Idaho, Associate

L. J. Felton, 225 37th St., S.E., Washington, D. C., Active

Warren J. Hays, 403 Mellon St., S.E., Apt. 3, Washington, D. C., Associate

D. Luther Hiltibridle 301 Ridge Rd., S.E., Washington, D. C., Associate

Orlando T. Kott, 404 Cherry St., Hillwood Square, Falls Church, Va., Active

Durward C. Partlow, 137 Mankin Walk, Hillwood Square, Falls Church, Va., Associate

Boston Branch

William E. Dailey, 72 Sycamore Ave., Brockton, Mass., Active

James J. Grossbard, 23 Claflin Rd., Brookline, Mass., Active

Howard R. Range, 17 Hartwell St., Waltham, Mass., Active

Chicago Branch

A. F. Cardenas, 3618 N. Sacramento Ave., Chicago, Ill., Active

D. English, 1553 N. 39th Ave., Melrose Park, Ill., Active
J. M. Grills, 1509 W. Kildare Ave., Chicago, Ill., Active
J. Hargraves, 4446 N. Austin Ave., Chicago, Ill., Active
H. J. Gausing, 4164 Drexel Blvd., Active (Reinstated)

Cleveland Branch

Sylvester G. Domen, 1534 Van Lee Circle, Mobile, Alabama, Active
Robert W. Renton, 1780 Idlehurst Drive, Euclid, Ohio, Associate

Dayton Branch

Ralph Leroy Clinefelter, 364 W. Hayes St., West Milton, Ohio, Active

Grand Rapids Branch

Franklin Snyder, (Wolverine Finishing Materials Co.), 917 N. Otillia, S.E., Grand Rapids, Mich., Associate
James A. Badaluco, (J. C. Miller Co.), 1053 Veto, N.W., Grand Rapids, Mich., Associate

Hartford Branch

I. Laird Newell, Henry Souther Engineering Co., Hartford, Conn.

New Haven Branch

Marvin A. Coan, (Bolton Manufacturing Co.), 54 Wharton St., West Haven, Conn., Active

Newark Branch

Herbert R. Millwater, (Aluminum Co. of America), Lakeside Trail W., E. Fayson Lake, Butler, N. J., Associate

New York Branch

Harold O. Booth, 27 Putnam Ave., Tarrytown, N. Y., Associate
Frank Dagnessa, 1457 Wilkins Ave., Bronx, N. Y., Active
Ralph Kaplan, 1076 Green Ave., Brooklyn, N. Y., Active
Vincent Ragone, 1977 E. 2nd St., Brooklyn, N. Y., Active

Philadelphia Branch

I. W. Marcovitch, Associate

Toronto Branch

Henry Sutton, 763 Millwood Rd., Toronto, Ont., Associate
George McFarlane, 36 Dennison Rd., E., Weston, Ont., Associate
Albert Clarke, 18 Maple Ave., Weston, Ont., Associate

Waterbury Branch

Albert R. Goodkin, c/o Puritan Mfg. Co., Waterbury, Conn., Associate
Frederick C. Strong III, 1737 Baldwin St., Waterbury, Conn., Associate

APPLICATIONS

Baltimore-Washington Branch

Richard J. Norris
Stanley P. Watkins
Floyd Eugene Willison

Boston Branch

Charles R. Culgin, 673 Washington Elms, Cambridge, Mass., Active

Chicago Branch

R. J. Bilbo, 1045 N. Lawndale Ave., Chicago, Ill., Active
W. P. Coleman, 5232 N. Rockwell Ave., Chicago, Ill., Associate
G. P. Doppke, 4247 W. Hirsch St., Chicago, Ill., Associate
S. G. Englund, 1314 13th St., Rockford, Ill., Associate
V. Plesscher, c/o National Research Bureau, 320 N. LaSalle St., Chicago, Ill., Associate
T. H. Westby, c/o Sears Roebuck & Co., (Dept. 817), 925 S. Homan Ave., Chicago, Ill., Associate

Cleveland Branch

William Edwards, 12001 Corlette Ave., Cleveland, Ohio, Associate
Tully S. Hammer, 2074 E. 102nd St., Cleveland, Ohio, Active
Arlond E. Larson, 1424 Dill Ave., South Euclid, Ohio, Associate
Henry J. Schmidt, 2855 E. 99th St., Cleveland, Ohio, Active

Arthur A. Schuenemann, 4203 W. 63rd St., Cleveland, Ohio, Associate

Dayton Branch

Keith Wilson Netzley, P.O. Box, Ithaca, Ohio, Associate
Frank H. Schalden, 604 Berkly Rd., Columbus, Ohio, Associate

New York Branch

David B. Garfinkel, Gomper's Vocational High School, Bronx, N. Y., Associate
William Printz, c/o Wm. Printz & Co., 45 W. 34th St., New York, N. Y., Associate

Waterbury Branch

Henry O. Streeter, 97 Elmwood Ave., Waterbury, Conn., Associate

TRANSFERS

V. Julianne from New Haven Branch to Philadelphia Branch

SUSPENSIONS

Baltimore-Washington Branch

Eben J. Crum
Amos E. Judd
Emory L. Plate

Boston Branch

Joseph P. Laskey

New York Branch

Joseph Citron
John G. Martini

DEATHS

Charles H. Proctor, New York Branch
Walter W. Rowe, Waterbury Branch
W. E. Hurd, Los Angeles Branch

RESIGNATIONS

Harry Simon, New York Branch

CHANGE IN STATUS

The following members of Waterbury Branch, from Associate to Active: Isidore Cross, Charles Nardozzi, George Muscio, Maurice H. Henry

MEMBERSHIP CHART

BRANCH	May 1942	Change in Membership	Percent Change
CINCINNATI	42	+13	+30.9
CLEVELAND	81	+18	+22.2
BALT.-WASHINGTON	82	+12	+14.6
MONTREAL	44	+ 6	+13.6
SYRACUSE	31	+ 4	+12.9
INDIANAPOLIS	48	+ 6	+12.5
NEWARK	156	+17	+10.8
TORONTO	87	+ 7	+ 8
ROCHESTER	80	+ 5	+ 6.3
PITTSBURGH	52	+ 3	+ 5.7
WATERBURY	97	+ 4	+ 4.1
CHICAGO	258	+10	+ 3.8
BUFFALO	55	+ 2	+ 3.6
PHILADELPHIA	142	+ 3½	+ 2.5
SAN FRANCISCO	46	+ 1	+ 2.2
PROV.-ATTLEBORO	49	+ 1	+ 2
BINGHAMTON	16	0	0
DAYTON	99	— 1	— 1
MILWAUKEE	97	— 1	— 1
SPRINGFIELD	72	— 1	— 1.4
LANCASTER	44	— 1	— 2.3
NEW HAVEN	105	— 2½	— 2.4
BRIDGEPORT	80	— 2	— 2.5
HARTFORD	67	— 2	— 2.9
DETROIT	277	— 8	— 2.8
BOSTON	118	— 4	— 3.3
NEW YORK	139	— 6	— 4.3
ST. LOUIS	82	— 4	— 4.8
LOS ANGELES	128	— 8	— 6.3
GRAND RAPIDS	87	— 6	— 6.9
ANDERSON	38	— 4	—10.5
TOLEDO	46	—10	—21.7

MEMBERSHIP – May 1st, 1942 = 2845
MEMBERSHIP – Jan. 1st, 1943 = 2897
GAIN IN MEMBERSHIP 52
Percent of Gain = 1.8%

BUYERS' GUIDE

ABRASIVES

Harrison & Co., Haverhill, Mass.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., Waterbury, Conn.
Norton Company, Worcester, Mass.
Roberts Rouge Co., Stratford, Conn.

ACTIVATED CARBONS

Darco Corporation, New York City
Industrial Chemical Sales, New York City

ALKALI CLEANING COMPOUNDS

Detroit Rex Products Co., Detroit, Mich.
Ford, J. B., Sales Co., Wyandotte, Mich.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products Inc., New York City
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ANODES, ACIDS AND SALTS

Apothecaries Hall Co., Waterbury, Conn.
du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
Preciment Laboratories, New York City
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.

ANODES, ACIDS AND SALTS

Stevens, Frederic B., Inc., Detroit, Mich.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

ANODES—CHROMIUM PLATING

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio
Heil Engineering Company, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
McGean Chemical Co., Cleveland, Ohio
Seymour Mfg. Co., Seymour, Conn.
Stevens, Frederic B., Inc., Detroit, Mich.
Storts Welding Co., Meriden, Conn.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

ANODES—COPPER

American Brass Co., Waterbury, Conn.
du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
McGean Chemical Co., Cleveland, Ohio
Seymour Mfg. Co., Seymour, Conn.
Stevens, Frederic B., Detroit, Mich.
Stutz, George A. Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

ANODES—ELECTRIC CLEANER

Lasalco, Inc., St. Louis, Mo.
Storts Welding Co., Meriden, Conn.
Stutz, George A., Mfg. Co., Chicago, Ill.

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ANODES—NICKEL

Seymour Mfg. Co., Seymour, Conn.

ANODES—ZINC

du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harshaw Chemical Co., The, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
Meaker Company, The, Chicago, Ill.
Seymour Mfg. Co., Seymour, Conn.
Stevens, Frederic B., Inc., Detroit, Mich.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

BALL ANODES

du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

BUFFS AND BUFFING COMPOSITIONS

Advance Polishing Wheels, Inc., Chicago, Ill.
Apothecaries Hall Co., Waterbury, Conn.
Burns, E. Reed, Corp., Brooklyn, N. Y.
Divine Brothers Co., Utica, N. Y.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
L'Hommedieu, Chas. F., & Sons, Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., Waterbury, Conn.
MacDermid, Inc., Waterbury, Conn.
Matchless Metal Polish Co., Glen Ridge, N. J., and Chicago, Ill.
Puritan Mfg. Co., Waterbury, Conn.
Roberts Rouge Co., Stratford, Conn.
Stevens, Frederic B., Detroit, Mich.

BUFFS AND BUFFING COMPOSITIONS

Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.
United Laboratories, Linden, N. J.

BURNISHING BARRELS AND BALLS

Abbott Ball Co., Hartford, Conn.
Baker, M. E., Co., Cambridge, Mass.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
Magnuson Products Corp., Brooklyn, N. Y.
Storts Welding Co., Inc., Meriden, Conn.

BURNISHING COMPOUNDS

Ford, J. B., Co., The, Detroit, Mich.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Lasalco, Inc., St. Louis, Mo.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York City

CADALYTE PLATING MATERIALS "CARBONATE REMOVER"

du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Lasalco, Inc., St. Louis, Mo.

CADMIUM SERVICE

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Udylte Corp., The, Detroit, Mich.

CADUX MATERIALS

Hanson-Van Winkle-Munning Co., Matawan, N. J.

CEMENT—GLUE SUBSTITUTE

Harrison & Co., Haverhill, Mass.

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CEMENT POLISHING WHEEL

Harrison & Co., Haverhill, Mass.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.

CHROMIUM SERVICE

Hanson-Van Winkle-Munning Co., Matawan, N. J.
United Chromium, New York City

CLEANERS AND CHEMICALS

Apothecaries Hall Co., Waterbury, Conn.
Detroit Rex Products Co., Detroit, Mich.
du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Enthone Co., New Haven, Conn.
Ford, J. B., Co., Wyandotte, Mich.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
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MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
McGean Chemical Co., The, Cleveland, Ohio
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Merck & Co., Inc., Rahway, N. J.
Norton Co., Worcester, Mass.
Oakite Products, Inc., New York City
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Puritan Mfg. Co., Waterbury, Conn.
Stevens, Frederic B., Inc., Detroit, Mich.
Sulphur Products Co., Greensburg, Pa.
Udylte Corp., The, Detroit, Mich.
Zialite Corporation, Mt. Vernon, N. Y.

COILS—PLATING TANKS

Heil Engineering Company, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
Storts Welding Co., Meriden, Conn.

DEGREASERS

Blakeslee, G. S., & Co., Chicago, Ill.
Detroit Rex Products Co., Detroit, Mich.
Mechanical Process, South Orange, N. J.
Phillips Mfg. Co., Chicago, Ill.

EQUIPMENT

Alsop Engineering Corp., Milldale, Conn.
Blakeslee, G. S., & Co., Chicago, Ill.
Ceilcote Company, Cleveland, Ohio
Detroit Rex Products Co., Detroit, Mich.
Divine Brothers Co., Utica, N. Y.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hammond Machinery Builders, Kalamazoo, Mich.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
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Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.
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L'Hommedieu, Chas. F., & Sons Co., Chicago, Ill.
Meaker Co., The, Chicago, Ill.
Mechanical Process Company, South Orange, N. J.
Miller, J. C., Company, Grand Rapids, Mich.
Paasche Airbrush Company, Chicago, Ill.
Packer Machine Co., The, Meriden, Conn.
Phillips Mfg. Co., Chicago, Ill.
Stevens, Frederic B., Inc., Detroit, Mich.
Storts Welding Co., Meriden, Conn.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.
United Laboratories, Linden, N. J.

LEAD LINED TANKS

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Heil Engineering Company, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
Storts Welding Co., Meriden, Conn.
Udylite Corp., The, Detroit, Mich.

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Meaker Company, The, Chicago, Ill.

METAL LACQUERS AND FINISHES

Alrose Chemical Co., Providence, R. I.
Atlas Powder Co., Zapon Div., Stamford, Conn.
Egyptian Lacquer Mfg. Co., New York City
Heatbath Corporation, Springfield, Mass.
Maas & Waldstein Co., Newark, N. J.
New Wrinkle, Inc., Dayton, Ohio
Preciment Laboratories, New York City

METAL WORKING LUBRICANTS

Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York City

OXIDIZING AGENTS

Lasalco, Inc., St. Louis, Mo.
Mitchell-Bradford Chemical Co., Bridgeport, Conn.
Puritan Mfg. Co., Waterbury, Conn.
Sulphur Products Co., Greensburg, Pa.

PLATING BARRELS

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.
Stevens, Frederic B., Inc., Detroit, Mich.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

PLATING TANKS

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Heil Engineering Company, Cleveland, Ohio
Lasalco, Inc., St. Louis, Mo.
Stevens, Frederic B., Inc., Detroit, Mich.
Storts Welding Co., Meriden, Conn.

PLATING TANKS

Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.
U. S. Stoneware Co., New York City

POLISHING LATHES

Baker, M. E., Co., Cambridge, Mass.
Divine Brothers Co., Utica, N. Y.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hammond Machinery Builders, Kalamazoo, Mich.
Hanson-Van Winkle-Munning Co., Matawan. N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. E., & Sons Co., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.

PLATING—PRECIOUS METALS

Baker & Co., Inc., Newark, N. J.
Merck & Co., Rahway, N. J.
Spectranome, New York City

POLISHING WHEELS AND MATERIALS

Advance Polishing Wheels, Inc., Chicago, Ill.
Baker, M. E., Co., Cambridge, Mass.
Burns, E. Reed, Brooklyn, N. Y.
Divine Brothers Co., Utica, N. Y.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.
L'Hommedieu, Chas. E., & Sons Co., Chicago, Ill.
Matchless Metal Polish Co., The, Glen Ridge, N. J., and Chicago, Ill.
Miller, J. C., Co., Grand Rapids, Mich.
Puritan Mfg. Co., Waterbury, Conn.
Roberts Rouge Co., Stratford. Conn.
Stevens, Frederic B., Detroit, Mich.
Stutz, George A., Mfg. Co., Chicago, Ill.
Udylite Corp., The, Detroit, Mich.
United Labortories, Linden, N. J.

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ROUGES

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Harrison & Co., Haverhill, Mass.
Lasalco, Inc., St. Louis, Mo.
Matcheless Metal Co., Glen Ridge, N. J.
Roberts Rouge Co., Stratford, Conn.
Stevens, Frederic B., Detroit, Mich.
Udylite Corp., The, Detroit, Mich.

RUBBER-LINED TANKS

Heil Engineering Co., Cleveland, Ohio
Lasalco, Inc , St. Louis, Mo.
Storts Welding Co., Meriden, Conn.

SOAPS

Hanson-Van Winkle-Munning Co., Matawan, N. J.
Lea Mfg. Co., The, Waterbury, Conn.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York City
Udylite Corp., The, Detroit, Mich.

SOLUTION CONTROL METHODS

du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Hanson-Van Winkle-Muning Co., Matawan, N. J.
Lasalco, Inc., St. Louis, Mo.

SOLVENTS—DEGREASING

Detroit Rex Products Co., Detroit, Mich.
Lasalco, Inc., St. Louis, Mo.
Lea Mfg. Co., The, Waterbury, Conn.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Mechanical Process Co., South Orange, N. J.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Phillips Mfg. Co., Chicago, Ill.

SOLVENTS—DEGREASING

Westvaco Chlorine Products Corp., New York, N. Y.

STRIPPING COMPOUNDS

Detroit Rex Products Co., Detroit, Mich.
du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Gumm, Frederick, Chemical Co., Inc., Kearny, N. J.
MacDermid, Inc., Waterbury, Conn.
Magnus Chemical Co., Garwood, N. J.
Magnuson Products Corp., Brooklyn, N. Y.
Oakite Products, Inc., New York City

TESTING INSTRUMENTS

American Instrument Co., Silver Spring, Md.
du Pont, E. I., de Nemours & Co., Inc., Wilmington, Del.
Harshaw Chemical Co., The, Cleveland, Ohio
Industrial Filter & Pump Mfg. Co., Chicago, Ill.
Kocour Co., Chicago, Ill.
Lasalco, Inc., St. Louis, Mo.

TUMBLING BARRELS

Abbott Ball Co., Hartford, Conn.
Baker, M. E., Co., Cambridge, Mass.
Lasalco, Inc., St. Louis, Mo.
Storts Welding Co., Meriden, Conn.

UDYLITE CADMIUM SERVICE

MacDermid, Inc., Waterbury, Conn.
Udylite Corp., The, Detroit, Mich.

USED EQUIPMENT

Baker, M. E., Co., Cambridge, Mass.

WASHERS—METAL PARTS

Blakeslee, G. S., & Co., Chicago, Ill.
Detroit Rex Products Co., Detroit, Mich.

BRANCH DIRECTORY

ANDERSON meets second Tuesday of every month at 7:30 p.m., at the Y. M. C. A. Anderson, Indiana. Secretary-Treasurer, E. L. McKinney, 2014 Fairview St., Anderson, Ind.

BALTIMORE-WASHINGTON meets at the Telford Buffeteria, 14th and Decatur Sts., N.W. Washington, D. C., the first Saturday of each month. Secretary-Treasurer, Abner Brenner, 6509 Fulton St., Chevy Chase, Md.

BINGHAMTON Secretary-Treasurer, Austin Fletcher, 406 Conklin Ave., Binghamton, N. Y.

BOSTON meets at the Hotel Statler, Boston, Mass., first Thursday each month. Secretary, A. W. Garrett, 77 Neponset Ave., Dorchester, Mass.

BRIDGEPORT meets first Friday of each month at Chamber of Commerce Rooms, Stratfield Hotel, Secretary-Treasurer, Joseph G. Sterling, 134 Colony St., Bridgeport, Conn.

BUFFALO meets second Friday of each month at Hotel Statler, Buffalo, N. Y. Secretary, J. P. Mays, c/o Carborundum Co., Niagara Falls, N. Y.

CHICAGO meets second Friday of each month at 8 p.m., Atlantic Hotel, 316 S. Clark St. Secretary, J. W. Hanlon, 3004 N. Whipple St., Chicago, Ill.

CINCINNATI meets on Fourth Thursday of each month at 8 p.m., at Hotel Gibson, Cincinnati, Ohio. Secretary, Alcide E. Foreman, Rt. 9, Van Zandt Road, Box 313, Cincinnati, Ohio.

CLEVELAND meets first Saturday of each month at Cleveland Hotel. Secretary-Treasurer, G. B. Svenson, c/o Plater Supply, 2059 Hamilton Ave., Cleveland, Ohio.

DAYTON meets second Friday of each month at the Engineers Club, Dayton, Ohio. Secretary-Treasurer, W. M. Durnbaugh, R. R. 4 Xenia, Ohio.

DETROIT meets the first Friday of each month at the Hotel Statler. Acting Secretary-Treasurer, Wright M. Wilson, 1570 Anita Ave., Grosse Point Woods, Mich.

GRAND RAPIDS meets second Friday of each month, 7:30 p.m., at the Browning Hotel. Secretary-Treasurer, C. E. Abel, 11 Scribner Ave., N.W., Grand Rapids, Mich.

HARTFORD meets third Monday of each month alternately at Hartford Electric Light Company, Hartford and at the Elks Club, corner South and Main Sts., Bristol, Conn. Special meetings are held at the New Britain Trade School, New Britain, Conn. Secretary-Treasurer, Kenneth Bellinger, 16 Mountain View Drive, Newington, Conn.

INDIANAPOLIS meets at the Hotel Riley, the first Wednesday of each month. Secretary-Treasurer, W. W. Cothran, 5242 Boulevard Place, Indianapolis, Ind.

LANCASTER meets second Friday of each month at 8 p.m., at Thaddeus Stevens Industrial School, Lancaster, Pa. Secretary-Treasurer, W. H. Fordney, 603 Marietta Ave., Lancaster, Pa.

LOS ANGELES meets second Wednesday of each month at 6:30 p.m., at the Elks Club, 607 S. Parkview, Los Angeles. Secretary-Treasurer, C. C. McLaren, 2236 Charnwood, Los Angeles, Calif.

MILWAUKEE meets first Friday of each month at Republican Hotel. Secretary-Treasurer, James Durnford, 2552 N. Weil St., Milwaukee, Wis.

MONTREAL meets first Monday of each month at Mount Royal Hotel, Montreal, Quebec, Canada. Secretary-Treasurer, Eugene Feeley, 8271 Foucher St., Montreal, Quebec.

NEWARK meets first and third Friday of each month at Hotel Robert Treat, Newark, N. J., at 8 p.m. Secretary-Treasurer, George Wagner, 1130 So. Long Ave., Hillside, N. J.

NEW HAVEN meets the first Tuesday of each month at Sterling Chemistry Laboratory, Yale University. Secretary-Treasurer, Walter Lynch, 110 Peck St., New Haven, Conn.

NEW YORK meets second and fourth Fridays of each month, in the Hotel Pennsylvania, 7th Ave. and 33rd St., New York City, N. Y. Secretary-Treasurer, Franklyn MacStoker, 25 Princeton St., Garden City, L. I., N. Y.

PHILADELPHIA meets fourth Friday of each month, in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. No regular meeting in Nov., will meet Dec. 11th. Secretary, Paul Mentzer, 408 Princeton Ave., Philadelphia, Pa.

PITTSBURGH meets first Thursday of each month, at 8 p.m. at the Bureau of Mines Building, 4800 Forbes St., Pittsburgh, Pa. Secretary-Treasurer, Frank Keller, 1102 Hiland Ave., Corapolis, Pa.

PROVIDENCE-ATTLEBORO meets at the Providence Biltmore Hotel the third Monday of each month. Secretary-Treasurer, Frederick E. Allen, 260 Fair Street, Edgewood Station, R. I.

ROCHESTER meets third Friday of each month at the Hotel Seneca. Secretary-Treasurer, Donald C. Blum, 672 Mt. Read Blvd., Rochester, N. Y.

SAN FRANCISCO meets second Thursday of each month at Progressive Plating Works, 881-27th St., Oakland. Secretary-Treasurer, C. R. Macdonald, 5363 Shafter Ave., Oakland, Calif.

SPRINGFIELD meets the fourth Monday of each month at the Hotel Charles. Secretary-Treasurer, D. S. Hartshorn, Jr., 76 Edendale St., Springfield, Mass.

ST. LOUIS meets first Friday of each month at Central Y. M. C. A., 16th and Locust Sts., Secretary-Treasurer, C. T. McGinley, 8238 Monroe St., St. Louis, County, Mo.

SYRACUSE meets second Friday of each month at Bowne Hall, Syracuse University, Syracuse, N. Y. Secretary, George Simmons, 309 Park Ave., Herkimer, N. Y.

TOLEDO meets first Thursday of each month, in the office of Mr. Spanolis. Secretary, Gaston Bergeman, 718 Howland St., Fremont, Ohio.

TORONTO meets second Friday of each month at Royal York Hotel. Secretary-Treasurer, G. G. Harris, 621 Beresford Ave., Toronto, Ont., Canada.

WATERBURY meets second Friday of the month at Elton Hotel. Secretary-Treasurer, Spencer L. Henn, Apothecaries Hall Co., Waterbury, Conn.

A. E. S. OFFICERS

President: CHARLES C. CONLEY . . . . . 900 Chestnut St., Sidney, Ohio
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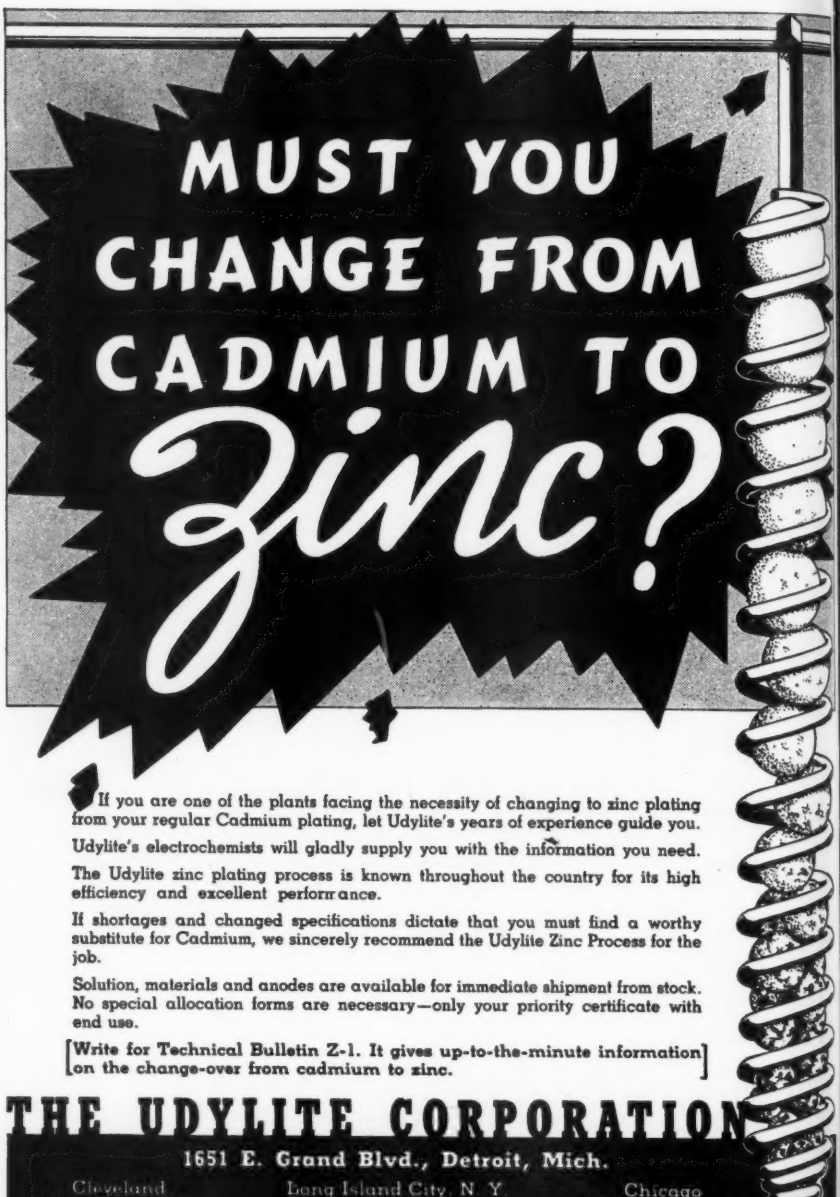

If you are one of the plants facing the necessity of changing to zinc plating from your regular Cadmium plating, let Udylite's years of experience guide you.

Udylite's electrochemists will gladly supply you with the information you need.

The Udylite zinc plating process is known throughout the country for its high efficiency and excellent performance.

If shortages and changed specifications dictate that you must find a worthy substitute for Cadmium, we sincerely recommend the Udylite Zinc Process for the job.

Solution, materials and anodes are available for immediate shipment from stock. No special allocation forms are necessary—only your priority certificate with end use.

[Write for Technical Bulletin Z-1. It gives up-to-the-minute information on the change-over from cadmium to zinc.]

THE UDYLITE CORPORATION

1651 E. Grand Blvd., Detroit, Mich.

Cleveland
4408 Carnegie Ave.

Long Island City, N. Y.
11-15 44th Drive

Chicago
1943 Walnut Street

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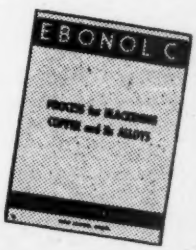

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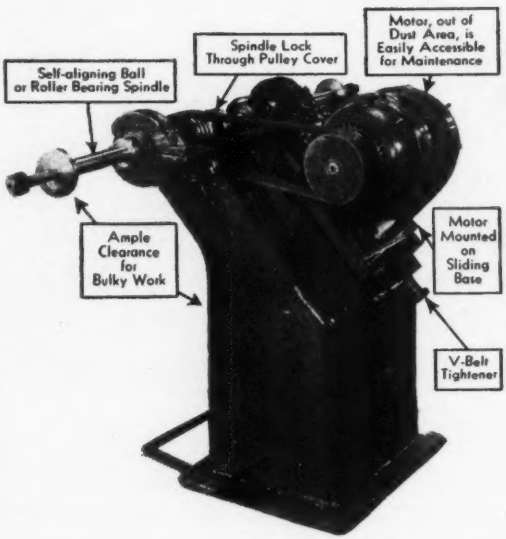
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